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LIST OF FOREIGN AGENTS (see first page "Official Notices").

Contents:

	PAGE
Extra-high-pressure Cables	161
The New Showrooms at Liverpool	162
Spanish Industrial Progress	162
New Roads and Electric Mains	163
Electrical Progress in the United States	163
British Engineering Standards Association	163
New Showrooms at Liverpool (*illus.*)	164
Coal Mining in 1924	165
The Manchester Mining Exhibition (*illus.*)	167
Belt and Rope Driving, by W. R. Needham (*illus.*)	169
A "Relay" Automatic Telephone Exchange (*illus.*)	170
Legal	171
Gas Engines and Electricity Supply	171
Reviews	172
Business Notes	174
Lighting and Power Notes	177
Electricity Supply in Preston (*illus.*)	179
Tramway and Railway Notes	183
Telegraph and Telephone Notes	184
Radio Notes	184
Contracts Open and Closed	184
Forthcoming Event	185
Notes	185
Institution Notes	186
Our Personal Column	186
New Companies Registered	187
Official Returns of Electrical Companies	188
City Notes	188
Stocks and Shares	189
The First International Congress of Radiology (*continued*)	191
Electricity at the Royal Agricultural Show (*illus.*) (*concluded*)	193
Short-wave Radio Communication (*illus.*)	195
Electrical Development in Spain	196
The Inquiry at Southend	197
New Electrical Devices, Fittings, and Plant (*illus.*)	198
Correspondence—	
Special a.c. Rectifiers	199
Lubricating Oil for Turbines	199
Parliamentary News	199
Japan's Electrical Imports and Exports	200
Published Specifications	200
Contractors' Column	Advertisement page xxxvi

Extra-High-Pressure Cables.

IT is an interesting comment on Mr. Everett S. Lee's paper before the American Institute of Electrical Engineers on "Testing High-Tension Impregnated Paper-insulated Lead-covered Cable," that the reports of the annual meetings of the shareholders in two very prominent British cable-making companies have announced in the one case the execution in this country of an important order for 75,000-volt cable, and in the other case the acquisition of an interest in an American cable-making company with a view to making e.h.p. cable behind the shelter of the Fordney Tariff.

It is, moreover, of interest that the discussion on Mr. Lee's paper and on that by Messrs. Del Mar and Hansen, recorded in recent issues of the *Journal* of the A.I.E.E., would seem to indicate that the experience of our American friends with 33,000-volt and 66,000-volt cable has been beset with a certain amount of trouble. We, too, have had a little, and apparently have found solutions. But habituated as we are to decrying our own performances, neither the C.M.A. nor its critics have found it necessary to confess to the occupation by Great Britain of a subordinate position in cable manufacture. Initially, perhaps, the difficulties may be said to have been due to the magnitude of the advance. The rules of design as to the proportioning of dielectric thickness for 6,600- and 11,000-volt cables—of which there are thousands of miles in existence—represent the advance due to years of experience, but when we consider the 33,000-volt cable, it is evident that pressures five times 6,600 volts introduce factors which are not in direct arithmetical proportion to the increased pressure. Still less is this the case when we have to consider the vital questions of uniformity of materials and uniformity in construction. At the lower pressures our factors of safety were such that the possibility of minor irregularities in impregnation did not greatly worry us. To-day, at pressures of 33,000 volts and over, the situation in this respect is greatly changed. To take a mechanical analogy, it is almost as though after for four or five generations using steel of 26 to 30 tons ultimate strength and working at one-third the elastic limit, we received for the first time a new alloy steel of 50 to 55 tons ultimate strength, and were compelled to work this up to 90 per cent. of its elastic

limit, with the added nightmare that the steel manufacturer could not guarantee uniformity of the metalloid constituents or uniformity of heat treatment.

We imagine that the magnitude of the change in pressure caused Mr. Lee to review the matter in the paper now under consideration, which was read in New York last February. Its summarised conclusions do not call for much critical examination: there is the dictum that "values of insulation resistance are of doubtful worth as a means of distinguishing between satisfactory and unsatisfactory cable"; "the test for dielectric strength is the most important and the best now available as a suitability test"; and "measurements of dielectric power loss and power factor are of value and should be continued." We doubt, however, the practicability of "periodic testing at voltages which will not injure sound cable, and which will only affect cables when the deterioration has been abnormal." Unfortunately the author does not define the percentage above normal pressure that would produce this result. Such periodic tests can, of course, be applied, when it is possible to isolate one of two e.h.p. feeders or to isolate one segment of a ring main. But an application of a test pressure to a cable *in service*, which will be sufficiently in excess of the normal voltage to be discriminatory, seems to us to be asking for trouble, in that it ensures the breakdown of a weak cable at an earlier date than would naturally be the case. That date may be merely days earlier, but if there should be any feeling that failure has been accelerated by weeks, most of us would prefer to wait and allow sleeping dogs to lie. The only good reason for making such a test appears to us to be that it could be applied at a slack time of year, when the removal of the cable from service would offer the least inconvenience. In other words, we should select the time for an inevitable breakdown to take place, rather than leave it to mature perhaps at a most inconvenient season. We note, however, that one speaker in the discussion expressed a firm belief in the proof testing of cables after installation—at six-monthly intervals and at one and a half times the working pressures, for fifteen minutes. The same speaker had no illusions as to what sample tests meant—he pointed out that on a 10-ft. piece for bending test the results do not reveal whether or not a 10-ft. sample cut from the other end of the cable will be as good as the first in meeting the bending test, and that there is nothing to indicate that a 10-ft. piece cut from the middle of the cable would yield as high a value.

Other speakers covered a wide range. One confessed that one-third of the failures in service revealed absolutely no discernible cause, and this speaker also put forward a figure-of-merit table based on inspections and tests on an order for 3-core, 13,000-volt cable distributed over seven factories. Points were awarded under 15 headings, six being for mechanical, five for electrical, and four for puncture tests. This table, which illustrates the differences in value in excess of specified limits, is certainly suggestive, but we are not sure that the scheduled scale of weights is correctly proportioned. The probability also remains that different scaling is necessary for 15,000-, 33,000-, and 66,000-volt cables. In any case the proof of the pudding lies in the eating. The seven cases cited vary in their figure of merit from 84.3 to 68.1 per cent. It will be of great interest—should the facts ever be disclosed—to learn five or six years hence whether there is any relation between the empirical total figure-of-merit value formulated and the working life, with special reference to the further question of the relation of the failure to the corresponding points making up the figure of merit. The possible fallacies in devising any figure of merit are indicated by the fact that it is most improbable that any two samples, 10 ft. in length, from the same drum would have identical values.

Passing to testing methods, the consensus of opinion was favourable to the e.h.p. direct-current method. When, however, the dielectric losses are low, recourse to recording instruments is necessary. Of even greater interest is the question of decomposition of the impregnating oil—a phenomenon akin in some of its aspects to the sludging of transformer oil.

Finally, there is the question of what are to be the test pressures and their duration on the finished cable! Many will feel that our current practice of applying a test pressure of 75,000 volts for fifteen minutes at the works to a finished 33,000-volt cable is unnecessarily drastic—it is always conceivable that too high a test pressure is a cause of incipient faults, which will develop later. In this connection it would be interesting—but expensive—to experiment with two drums—one submitted to twice and one to three times the working pressure for fifteen minutes. Afterwards a series of test samples could be taken from each drum and broken down. Any marked difference between the sets of samples would be almost conclusive. We use the qualification "almost," as we cannot at the works succeed in simulating the effects due to ageing.

Some day, when all the information now available (and more with regard to performance when laid) has been co-ordinated and when we all really understand what constitutes uniformity of impregnation and can ensure uniformity of materials, the manufacture of 66,000-volt cable will present no more anxieties than we have to-day over cables for one-tenth of that pressure. By that time we shall perhaps have a fresh set of anxieties about 200,000-volt cables.

The New Showrooms at Liverpool.

ELSEWHERE is this issue we make reference to the opening of new showrooms by the Liverpool Electricity Department, and reproduce some photographs of the premises. It is evident that the Corporation is making a great effort to build up its domestic load, and a well-appointed and well-managed showroom with a wide selection of appliances and intelligent demonstrations is an excellent means of stimulating the interest of the domestic consumer.

Our illustrations scarcely do justice to the beautifully-arranged apartments, but they serve to convey some impression of the care and thought that have been bestowed upon their decoration, furnishing, and "lay-out." We particularly like the idea of the lecture and demonstration room. It will be remembered that a large demonstration room and lecture hall are features of the big showroom scheme which Hackney completes in the early autumn. Practical demonstration is very necessary, not only as a means of selling appliances, but also to impart to customers a proper knowledge of their use. Many complaints of the expense of electric cooking are solely due to ignorance of the special methods which form one of its principal advantages.

Demonstration is not the only consideration, however; it is also necessary to have a reasonable rate for domestic electricity. This has been thought of, too, for the Corporation now has a two-part tariff, consisting of 5 per cent. of the rateable value of the consumer's premises per quarter, plus a halfpenny for each kWh consumed. This should bring electric cooking and heating within the reach of a very large section of the population. Liverpool has set a very good example to other large towns, and there is no doubt that the expenditure which has been incurred will be repaid a hundredfold both from the financial point of view and in the benefits which will accrue to the citizens from their adoption of electricity.

Spanish Industrial Progress.

IT will be seen from the report of the British Commercial Secretary at Madrid, which is reviewed in this issue, that there are a number of forward movements in progress in Spain. Hitherto the country has not been looked upon as an industrial (or industrious) state, but it appears that a modification of this view is very necessary if we are to form a true estimate of the position which Spain will occupy in a few years' time. Capt. Charles says that the expansion of industry has shown a very considerable

advance in the last few years. To-day there is very little which Spain does not produce, whereas before the war her manufactures were limited to a few lines. Some of her factories are so glutted with orders that they are unable to fulfil them. At the same time, Spain is still a large purchaser from abroad, and British manufacturers will find it profitable to study the market and make a bid for the business which is available. Activity has been very pronounced in the mining and metallurgical industries, as will be seen from the figures of production which we quote from the report. An outstanding feature of these industries is the rapidly-growing use of electric power. It is no doubt this and the railway electrification which is being undertaken in easy stages which have stimulated the development of the country's rich water-power resources. These amount in the aggregate to about 4½ million h.p., and about 1¼ million h.p. is already in use. We mentioned last week that a large scheme was being considered by a Pearson enterprise which was designed to provide all the electric power required throughout the province of Catalonia. It is noteworthy that an endeavour to enforce the use of Spanish plant and materials has been made by the Government in granting future concessions, but it is doubtful if Spanish industry can yet cope with this class of work. Capt. Charles reiterates the advice to would-be traders given in his last report, and sums up the requirements in two words, "efficiency" and "adaptability."

New Roads and Electric Mains.

We seem to have heard the last of the determined attempt which was made in the last session of Parliament and again in this one by certain county councils to place the cost of removing electric and other mains during the course of road reconstruction upon the public utility authority that owned them. The probable cost of this requirement is such a serious matter that the attempt has been equally strenuously fought, and with success, by the public utility authorities. Questions of this nature, of course, can only be raised when a public-utility concern is before Parliament with a Bill, and, as a matter of fact, the fight has been taking place in connection with some relatively small gas and water undertakings. The electricity and water supply authorities were involved, however, in what was a matter of important general principle, and concerted action was taken. The position can briefly be thus stated: In many road reconstruction schemes it frequently happens that a road may be doubled in width, and unless the mains which have been laid under the footpath are moved, they will be found under the surface of the new roadway, where not only will it be inconvenient to get at them for the purpose of repair, but they will also be subjected to a very much heavier traffic than the people who laid them originally ever contemplated. Thus they will be exposed to the risk of serious damage. Alternatively, they may be overlaid with a thick bed of concrete. Obviously, therefore, such mains must be moved to the sides of the widened roads, and with an ingenuity that did counsel credit, it was argued in one or two cases that this cost should fall upon the authority owning the mains, but not with much success. The point, however, was being pursued by the county councils in such a way that a conference of electricity, gas, and water authorities was held, and it was decided to bring the matter to a head in connection with the demands of the East Sussex County Council in relation to the Uckfield Gas and Electricity Bill and the Burgess Hill Water Bill this session. The County Council did not oppose when these Bills were before the House of Lords, but reserved the right to do so when they came before the House of Commons. The conference in question decided to fight the East Sussex County Council, and it was arranged that the expense should be borne between the three interests. Fortunately wiser counsels have prevailed, for when the Uckfield Bill came before the Unopposed Bills Committee of the House of Commons recently there was found in it a clause which laid it down that in the case of road widenings the cost of the removal of mains should be borne by the county council, whilst in the case of county bridges the cost should be borne by the authority owning the mains. The latter, of course, does not mean much, and was probably conceded in an endeavour to settle the matter. On the main question of principle, the public-utility undertakings have secured a valuable precedent, and it is hardly likely that other county councils will trouble further in the matter.

Electrical Progress in the United States.

The latest available figures of the growth of the electricity supply industry of the United States have refuted those who gave it as their opinion that the peak of progress was reached in 1923 and that thereafter the annual increment would gradually decrease. According to a survey recently completed by the *Electrical World*, 2,178,283 new customers of all classes were added to the service lines of the central stations during 1924, whereas during 1923, when progress was assumed to be at its highest possible level, the increase was 2,042,711.

It is shown that "domestic lighting customers" formed the most important class, their numbers rising from 11,613,348 to 13,395,887 out of a total of 16,555,714 at January 1st, 1925. We presume that this class covers domestic users generally, not merely those who use electricity for lighting alone. Commercial and industrial consumers also increased in number at a satisfactory rate, but there is no doubt that it is to the domestic load that American electricity suppliers are looking for the bulk of their revenue.

If the number of domestic consumers can show a growth of over 15 per cent. in a year in a country which is so well developed electrically as the United States, what are the possibilities in Great Britain?

There is little doubt that with the expenditure of a relatively small amount of money and effort, the mass of the people will be brought to a realisation of what electricity means.

British Engineering Standards Association.

In his review of the year's work of the B.E.S.A. at the annual meeting, which is referred to elsewhere in this issue, the chairman found himself able to strike a more hopeful note than was done this time last year, both as regards organisation as well as finance. The deficit carried forward from the previous year has been reduced, but it is sad to relate that there are no funds at present for carrying on the translation of British Standard Specifications into foreign languages, and accordingly their dissemination abroad has had to cease—a regrettable happening, and it is to be hoped that such valuable work will not have to be in abeyance for long.

It is announced, however, that a new scheme is to be put in operation next autumn whereby the Association's membership will be so reorganised as to allow the Main Committee to obtain the support of professional engineers, individual firms, and business men connected with all the great industries of the country. It is interesting to learn that individuals will now be given the privilege of becoming members of this important body. Membership will carry with it advantages too numerous to mention. The Prime Minister, who is personally familiar with B.E.S.A.'s work, has addressed a letter to the chairman expressing the hope that the Association will be successful in the effort now being made to widen the scope and influence of its work. Moreover, it is hoped that H.M. Government will eventually find itself in a position to give greater support than at present to the movement. It is confidently expected that all those connected with our great industries who are able to do so will lose no time in placing at the disposal of the B.E.S.A. Main Committee that additional measure of support which is so necessary in order to enable it to prosecute its national campaign successfully and, at the same time, make its work effective throughout the world.

D

New Showrooms at Liverpool.

The Corporation's Fine Display of Domestic Electrical Appliances.

THE Liverpool Corporation's new electrical showrooms, which occupy a commanding site in the centre of the town, were opened on July 20th by the Lord Mayor of Liverpool. The premises are situated in Whitechapel, within a stone's throw of Lord Street, which is one of the principal shopping thoroughfares of the city. The premises cost several thousands of pounds to adapt to the purpose for which they are now applied, and the result is one which does credit to the city of Liverpool. It is claimed that the showrooms, which contain about 2,000 electrical appliances, are the finest in the country. The premises were entirely re-modelled by Messrs. Ashby Tabb, Ltd., and the electrical furnishing and the arrangement of the displays were supervised by the city electrical engineer, Mr. H. Dickinson. Entering the premises on the ground floor, there is a fine reception hall (fig. 1) reminiscent of the Tudor period, replete with showcases fitted with glass shelves, which are wired and contain sockets so that plugs may be inserted for the display of lighting effects, &c. On the first floor there is a special showroom for the display of electric light fittings, pendants, shades and lamps of all descriptions. In this apartment alone there are on view close on 300 patterns of electric light fittings. The showcases, in old oak with glass shelves, are wired in the manner indicated above, and these display 96 varieties of shades and fittings. Adjoining is a demonstration room to seat about 70 persons (fig. 2). Here it is intended that specialists shall give demonstrations in cooking, washing, &c. On the second floor, fig. 3, which is reached by a lift, there is a whole host of appliances, from sewing machines to electrically-operated calculating machines. Adjoining there is a suite of four rooms approached through a little garden courtyard. A projecting window gives one a glimpse into a very cosily-furnished and electrically-lighted bedroom. On the right there is a passage illuminated by an antique flambeau. The bedroom opens into a bathroom. Then there are a dining room, a kitchen and a scullery. Space will not permit us to give a detailed review of the electrical exhibits, which are so numerous and varied, but the showrooms certainly do justice to the progressive ideals of the City of Liverpool electricity department.

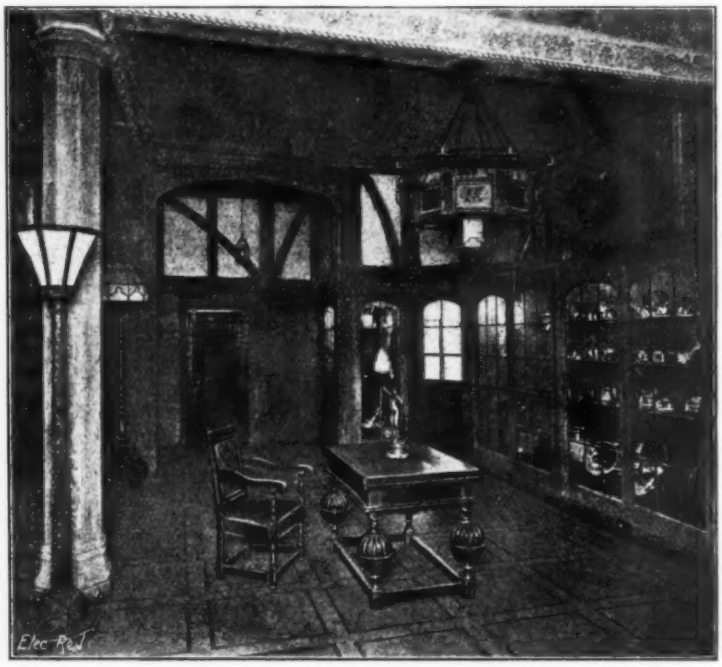

Fig. 1.—Part of the Reception Hall.

Speaking at the opening ceremony, Mr. F. Wilson, chairman of the Electricity Committee, said that there would be demonstrations at frequent intervals of all kinds of electrical appliances, and it could be depended upon that the showrooms would endeavour to keep the public informed of the latest developments in electrical devices for the home. Last year the Corporation decided to hire out electric cookers at a charge of 5s. per quarter, including fixing and maintenance. At the present time, continued Mr. Wilson, 800 cookers were installed, and a large demand was expected from the outside districts. If the department could develop the demand for electricity during the off-peak hours of the day, it would be possible to greatly reduce the cost of current.

Fig. 2.—The Demonstration Hall.

Fig. 3.—The Main Showroom.

A special domestic rate consisting of a fixed charge of 5 per cent. of the rateable value per quarter, plus a "running" charge of ½d. per kWh, has been instituted to encourage the use of electricity in the home.

Coal Mining in 1924.

Reports of the Secretary for Mines and H.M. Chief Inspector of Mines.

THE report of the Secretary for Mines contains much information regarding the coal output and wages for the year 1924. Following a year of prosperity in 1923, with an output second only to the record year of 1913, with the exports exceeding even that year, it is much to be regretted that the year 1924 was one of "gradually deepening depression."

The boom of 1923 had been caused by the dislocation of the Ruhr coalfield, and the resumption of normal production, as might have been expected, shattered it, and even the year 1924 might have been worse had not the home demand at the beginning of the year improved—but this demand gradually fell off and prices declined. Output fell by 9 million tons, and exports by 19 million tons. Values at the beginning of the year were good, but they subsequently declined, so that on balance they showed little change from the previous year, for while export prices were lower, inland prices were higher. The earnings of the workers were slightly higher than in 1923. Although 9 million tons lower than in 1923, the output in 1924 was higher than in any other year except 1907, 1911, and 1913. Up to the middle of May, a high rate was maintained and, except for holiday periods, and a fortnight when transport was disorganised by a strike of locomotive enginemen, it was not less than 5⅔ million tons in any week, and reached nearly 6 million tons in the second week of April.

With the close of the house coal season, and the recovery in the output of coal abroad, production declined, and fluctuated between 5 and 5¼ million tons a week from June to the middle of November. A belated seasonable improvement then occurred, but the demand for house coal was lower than usual. In all 267 million tons of saleable coal was raised in 1924, as compared with 276 million tons in 1923 and nearly 287½ million tons in 1913.

The active developments in the newest coalfields is reflected in the higher level of output in Yorkshire, which was 7 per cent. greater than in 1913, and in Nottingham and Derbyshire, which was 2 per cent. greater. In all other districts except Kent, the output of coal was lower than in 1913. The difference amounted to 3 per cent. in the Staffordshire, Salop, Worcester, and Warwickshire district, 8 per cent. in Northumberland, 10 per cent. in South Wales and Monmouthshire, 12 per cent. in Durham, 17 per cent. in Lancashire, Cheshire, and North Wales, and nearly 15 per cent. in Scotland. It is interesting to observe that in the anthracite industry production has increased by one-eighth since the year 1922 and exceeded that of 1913 both in 1923 and in 1924.

The number of persons employed was 1,193,668 at the middle of May, the highest number recorded since the resumption of work at the mines after the national stoppage in 1921. By the middle of November the number had fallen to 1,135,380, but it increased subsequently to 1,137,173 at the end of the year, as compared with 1,184,786 at the end of 1923.

The export demand for British coal and coke, which reached "record" dimensions in 1923 owing to troubles in the Ruhr, was sharply checked in 1924. The production of coal at German mines increased from 6,302,000 metric tons in December, 1923, to 10,826,000 tons in

TABLE A.—COAL-CUTTING MACHINES AND CONVEYORS IN USE AT THE COAL FACE.

District.	Machines in Use.							Tons of Coal Cut.					Percentage of Total Output.	Number of Conveyors at Coal Face
	Disk.	Bar.	Chain.	Percussive.	Driven by Electricity.	Driven by Compressed Air.	Total number of Machines.	Disk	Bar.	Chain.	Percussive.	Total.		
1. Northumberland ...	62	23	159	350	203	391	594	674,113	153,445	1,661,663	1,383,123	3,872,344	28	28
2. Durham	24	62	284	770	229	911	1,142	205,221	408,170	2,592,330	2,525,476	5,736,411	16	107
3. Cumberland and Westmorland ...	—	10	19	6	22	13	35	—	31,679	94,246	29,241	155,166	7	1
4. Lancashire and Cheshire	103	84	102	562	58	793	851	621,770	541,807	706,814	1,038,550	2,908,941	15	76
5. Yorkshire, South ...	27	32	170	175	106	305	411	371,151	713,857	1,811 2 0	469,566	3,365,824	11	123
6. Yorkshire, West ...	165	15	180	140	169	331	500	1,824,742	83,210	1,893,156	138,213	3,939,321	25	81
7. Nottinghamshire ...	41	48	158	12	204	55	259	362,690	334,636	1,557,380	38,915	2,293,621	16	17
8. Derbyshire (except South Derbyshire) 9. Derbyshire, South	19	43	178	67	164	143	307	176,986	423,521	2,297,883	78,117	2,976,507	18	35
10. Staffordshire, North	1	16	163	129	59	250	309	333	138,181	1,279,843	196,447	1,614,804	25	31
11. Cannock Chase ...	5	5	102	13	94	31	126	49,406	43,493	1,092,113	24,802	1,210,094	20	22
12. Staffordshire, South and Worcestershire 13. Leicestershire 14. Warwickshire	17	5	65	9	70	26	96	207,013	35,240	920,837	9,850	1,172,940	12	4
15. Shropshire	3	2	5	—	10	—	10	28,847	34,916	76,698	—	140,461	17	—
16. Forest of Dean 17. Somerset ... 18. Bristol ... 19. Kent	2	7	2	2	11	2	13	7,906	43,448	6,696	3,083	61,133	2	13
20. South Wales and Monmouth ...	2	76	250	81	383	326	409	17,622	564,849	1 979,166	58,311	2,619,948	5	671
21. North Wales... ...	14	24	47	55	44	96	140	52,676	328 328	389,827	45,184	816,015	24	13
23. Fife, Clackmannan, Kinross and Sutherland ...	147	89	93	14	311	32	343	2,035,656	884,926	1,088,359	39,153	4,048,094	48	63
23. Lothians (Mid. and East)	29	40	44	2	99	16	115	390,779	603,474	517,355	3,062	1,514,670	35	38
24. Lanarkshire, Linlithgow, Stirling, Renfrew & Dumbarton	515	291	226	17	994	55	1,049	5,293,969	2,536,019	2,387,014	79,413	10,296,415	54	47
25. Ayrshire, Dumfries and Argyll ...	37	42	34	8	114	7	121	314,870	334,956	500,574	17,450	1,167,850	26	3
Totals ...	1,213	921	2,281	2,412	3,044	3,783	6,830	12,635,750	8,238,155	22,853,204	6,177,956	49,910,559	19	1,373
Corresponding figures for 1923	1,240	882	1,841	2,192	2,745	3,414	6,159	14,216,091	8,156,053	19,363,065	5,784,805	47,526,439	17	1,157

March, 1924, and 11,944,000 tons in October, when it was slightly greater than the average monthly output of coal in 1913 in German post-war territories. For this reason, coupled with the increased output from the mines in France, Belgium, and Holland, exports of British coal to these countries and to Italy declined in 1924 by no less than 20,000,000 tons, though even so they were only 1¼ million tons less than in 1913. Elsewhere British exports were 1½ million tons greater than in 1923, but were still nearly 13 million tons below the level of 1913. The total quantity of coal exported was 59,179,000 tons in 1924, 77,974,000 tons in 1923, and 73,400,000 tons in 1913.

With regard to home consumption, 180⅓ million tons was available for consumption in Great Britain in 1924, as compared with 168¾ million tons in 1923. The 1924 figure was approximately the same as that of 1920, the year of the post-war "boom" in trade, and was 3½ million tons less than in 1913. Deducting miners' and household coal, the quantity available for industrial purposes was about 140 million tons. Of this, 54½ million tons was used by the collieries, public utility undertakings, and railway companies (1⅔ million tons more than in 1923), 14½ million tons in the manufacture of pig iron (rather less than in 1923), and for all other purposes 71 million tons (9⅔ million tons more than in 1923). These figures point to some temporary improvement in industry at home, except in the heavy iron and steel trades, which were affected directly or indirectly by the renewed activity of the Ruhr; but it is probable that to a large extent the increase represents replenishment of stock rather than actual consumption.

Over the year as a whole the average proceeds of all coal disposed of commercially amounted to 19s. 9d. per ton, practically the same as in 1923. This is the price at the pit-head, and the following are the all-ports annual average f.o.b. prices for exported coal:—1913, 13s. 10d.; 1922, 22s. 7d.; 1923, 25s. 2d.; 1924, 23s. 5d.

As regards wages, the average earnings per man shift for all classes of labour were 10s. 3d. for the first four months of the year under the old 1921 agreement, and 10s. 10¼d. under the present agreement, which expires at the end of this month, for the remaining eight months of the year. The wages, of course, for the skilled men were very much higher than this. The following gives particulars of the average income for the year from the sale per ton of the coal and its disbursement:—

Gross proceeds	19s.	10¾d.
Costs other than wages ...	5s.	5¾d.
Net proceeds	14s.	5d.
Wages costs	13s.	3d.
Gross profit	1s.	2d.

Total output per man shift, 17.59 cwt.
Average earnings per man shift, 10s. 7¾d.
Average number of shifts worked, 260.
Average yearly earnings per man, £138 4s. 7d.

The highest earnings were in Scotland of £150 13s. 3d. for 277 shifts, the average profit being 10d. per ton, and, strangely enough, in Kent, where the earnings

TABLE B.—ELECTRICAL EQUIPMENT AT MINES UNDER THE COAL MINES ACT IN 1924.

District.	Total Number of Mines at work.	Number of Mines at which Electrical Equipment is Installed.	Aggregate Horse Power of the Electric Motors in use. Below Ground. Haulage.	Pumping.	Portable Machinery.	Miscellaneous.	Total.	Above Ground. Winding.	Ventilation.	Haulage.	Coal Washing or Screening.	Miscellaneous.	Total.	Total Below and Above Ground.
1. Northumberland	125	73	16,441	17,410	6,444	1,113	41,408	8,151	6,589	2,100	3,821	13,187	33,848	75,2
2. Durham ...	293	176	55,381	53,708	7,796	4,036	120,921	16,185	21,790	14,453	17,064	49,867	119,359	240,2
3. Cumberland and Westmorland...	36	22	1,958	2,515	507	1,450	6,430	215	575	110	2,490	2,173	5,563	11,9
4. Lancashire and Cheshire ...	242	128	17,974	17,684	1,495	589	37,742	6,908	4,901	1,809	7,181	14,451	35,250	72,9
5. Yorkshire South	132	81	26,475	16,470	3,041	2,770	48,756	1,740	11,162	3,493	20,316	46,862	83,573	132,3
6. Yorkshire West.	181	99	12,376	8,890	4,697	1,152	27,115	3,313	2,814	1,254	7,720	11,912	27,013	54,1
7. Nottinghamshire	41	36	14,304	3,287	6,513	400	24,504	2,537	3,448	1,001	5,974	9,614	22,574	47,0
8. Derbyshire (except Derbyshire South	120	57	15,060	10 747	4,322	599	30,728	1,233	4,642	1,100	5,726	13,569	26,270	56,9
9. DerbyshireSouth	12	10	1,998	1,050	576	84	3,703	—	—	234	155	372	761	4,4
10. Staffordshire North	80	35	8,639	10,112	1,355	580	20,686	245	1,955	1,244	2,903	7,945	14,292	34,9
11. Cannock Chase .	32	27	8,110	1,305	3,045	293	12,756	1,350	765	934	2,479	2,810	8,338	21,0
12. Staffordshire South and Worcestershire	136	28	600	1,908	180	199	2,887	170	150	258	178	555	1,311	4,1
13. Leicestershire ...	26	17	2,139	819	895	30	3,883	—	100	283	361	846	1,590	5,4
14. Warwickshire ...	25	21	7,720	2,955	1,411	247	12,333	500	441	694	1,265	3,602	6,302	18,6
15. Shropshire ...	53	8	485	458	296	15	1,254	—	30	115	91	293	529	1,7
16. Forest of Dean	57	9	1,996	7,601	201	70	9,868	—	157	191	143	319	810	10,6
17. Somerset ...	18	12	1,312	808	46	124	2,290	—	55	60	97	366	578	2,8
18. Bristol	5	4	1,247	790	51	55	2,143	—	265	90	—	266	621	2,7
19. Kent	4	4	390	3,877	—	82	4,349	—	143	—	150	1,181	1,474	5,8
20. South Wales and Monmouth ...	656	385	79,900	83,895	2,496	2,574	168,805	53,809	31,831	27,886	18,168	75,843	207,537	376,3
21. North Wales ...	43	19	5,350	2,373	1,232	364	7,319	50	615	369	770	1,903	3,707	11,0
22. Fife, Clackmannan, Kinross and Sutherland	73	64	14,661	25,515	10,232	2,696	53,104	5,058	1,852	1,271	4,532	5,967	18,680	71,7
23. Lothians (Mid and East) ...	37	31	8,435	15,547	2,928	2,229	29,139	208	1,386	942	1,647	4,121	8,304	37,4
24. Lanarkshire, Linlithgow, Stirling, Renfrew and Dumbarton... ...	309	222	33,269	44,724	28,834	3,110	109,937	2,760	5,067	4,708	6,878	8,878	28,251	138,2
25. Ayrshire, Dumfries and Argyll	91	51	5,174	10,740	3,528	1,421	20,863	605	1,081	425	1,933	1,866	5,910	26,7
Totals...	2,855	1,630	343,586	348,803	92,121	26,386	810,896	107,139	102,911	68,230	112,660	280,096	671,036	1,481,9
Corresponding figures for 1923	2,902	1,598	312,225	333,140	82,257	25,516	753,138	91,810	96,456	63,079	99,126	261,136	611,607	1,364,7

are given as £150 1s. 1d. for 241 shifts, while the owners made a loss of 2¼d. per ton. Bristol district was the lowest with £113 0s. 11d. for 267 shifts and a loss of 6½d. per ton. It must be remembered that in all districts there is a minimum wage irrespective of production.

As showing the shocking state the industry is in, it should be noted that whereas the first four months of the year showed an average profit for all districts of 2s. 10d. per ton, the highest being 3s. 9¼d., and the lowest (Cumberland) 1½d., none showing a loss, while for the last eight months the 2s. 10d. had dropped to 9d.; only four showed a profit, and the remaining nine districts showed a loss varying from 2s. 4¾d. per ton in Cumberland to ¼d. per ton in South Staffordshire and Salop.

£6,023,001 was paid on account of royalties and wayleaves, including the rental value of freehold minerals where worked by the proprietor, very much of which went to the State in the form of taxes. If, however, this amount had been divided amongst the workmen it would have given them about 8½d. per shift worked. On the other hand, 24,907,890 shifts were lost during the year which could have been worked, representing a loss in wages of over £12,000,000 and a loss in output of over 21,000,000 tons of coal. Table C shows the tonnage of coal disposable commercially, and the average costs of production, proceeds, and profits for each quarter of the year 1924 in more detail.

Electrical equipment is still increasing, as tables A, B, and D show.

The number of flame safety lamps in use was 576,318, as against 584,761 in 1923. The number of electric safety lamps in use was 356,817, as against 327,929 in 1923.

TABLE C.

	March.	June.	Sept.	Dec.
	s. d.	s. d.	s. d.	s. d.
Proceeds	20 8	20 2¼	19 1¾	19 0
Wages	12 7½	13 8	13 8¼	13 1
Stores & Timber ...	2 1¾	2 2½	2 1½	2 0½
Other Costs ...	2 8¼	2 10¾	2 11	2 10
Royalties	0 6½	0 6½	0 6¼	0 6¼
Total Costs of Production	17 10¼	19 2¼	19 1¼	18 4¼
Credit	2 9¾	1 0¼	0 0¼	0 7¾
Approximate tonnage of coal disposable commercially	65,200,000	60,200,000	58,600,000	60,300,000

TABLE D.—NUMBER OF COAL-CUTTING MACHINES AT WORK AND QUANTITY OF COAL CUT.

	1924.	1923.	Inc. or dec.
Number of Mines at which Coal-cutting Machines were in use	908	857	51 +
Total number of Machines in use	6,830	6,159	671 +
Driven by Electric ty ...	3,044	2,745	299 +
Driven by Compressed Air	3,783	3,414	369 +
Percentage of Total Output cut by Machines ...	19	17	2 +
Total quantity of Coal cut	49,910,559	47,526,439	2,384,120 +

The number of horses and ponies employed in 1924 was 65,210, as against 65,579 in 1923.

The Manchester Mining Exhibition.

A Brief Review of the Electrical Apparatus Displayed.

It is unfortunate that the third Colliery and General Mining Engineering Exhibition, which was held at Manchester from July 7th to 18th (the last having been held 12 years ago) should have been staged at a time when the coal trade is under such a very heavy cloud of depression. The display was a very comprehensive one, and was spoken of on every hand as excellent, every branch of mining engineering being represented, and a study of the exhibits left the visitor with one feeling uppermost in the mind, *i.e.*, the crying need of the coal industry—stability. The latest appliances were shown, and were a credit to British manufacture, but who can blame the owner for hesitating to embark on exceptional capital expenditure under the circumstances which have pertained during the last few years? Nevertheless, it is necessary to show reasonable optimism, and the exhibition certainly encourages that aim. The electrical side of mining was given its fair share of prominence, and the following notes will give some idea of the scope of this department. Electricity was not treated in any way as a separate section, but in its natural order, as an integral part of the whole.

On the stand occupied by the University of Edinburgh and Heriot-Watt College the chief item of interest was the "Carboscope," the use of which was referred to in a paper read before the recent Radiological Congress. It is an X-ray examination set, by Messrs. Kent, McLaren & Thomson, of Edinburgh, by means of which the mineral content of coal can be ascertained at a glance, so that various grades of coal can be easily classified according to the fuel value, and the development of the device would seem to be of the greatest interest to all users of coal. It consists of a steel tank, filled with a highly-insulating oil, immersed in which are a high-pressure transformer and a Coolidge X-ray tube of the radiator type, these being connected together under oil. The transformer is of the step-up, closed-core type, and in the present instance gives 60,000 volts peak output. The X-ray tube employed is of the hot-cathode type, and two external terminals only are required, by means of which low-voltage alternating current is applied to the primary windings of the transformer. The whole outfit is compact and devoid of adjustments, or unnecessary accessories; there are no moving or rotating parts, and the whole is noiseless in action. The lid of the tank has near its centre a comparatively small opening through which emerges in an upward direction a cone-shaped beam of X-rays. If, therefore, an object is placed in the path of the

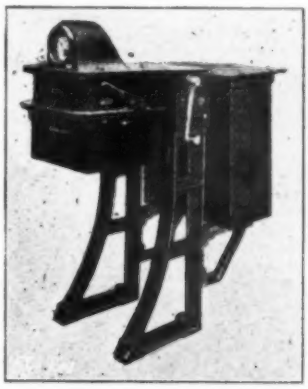

Fig. 1.—F.P. Circuit Breaker; 1,200 Amp.

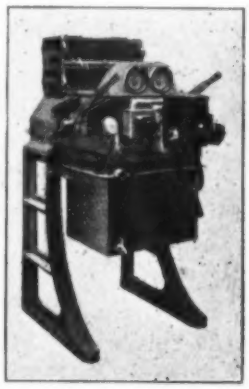

Fig. 2.—F.P. Flameproof Auto-transformer Starter.

beam and examined by means of a suitable fluorescent screen, the projected shadow will reveal the structural details of the object under examination, provided that its thickness or character are not such that they affect the total absorption of the radiation.

The "Clinophone," another instrument shown, is used in surveying boreholes for the freezing and cementation processes of shaft-sinking, where only extremely slight deviations are permissible. Orientation is by means of rods, and no magnet or gyroscopic compass is needed. The instrument is a continuous recorder, and is very rapid and accurate; deviation to within two minutes of arc is given. A hot-wire anemometer was also on view.

Messrs. Allen West & Co. had a large stand, on which could be seen complete control equipment for a 750-h.p. winder, comprising a liquid rotor controller, h.p. contactor, stator reverser, with lever operating gear assisted by a compressed-air engine. Amongst many electrical exhibits, mention should be made of the "S. R. I." oil-immersed stator and rotor starter for use with 3-phase a.c. slip-ring induction motors up to 650 volts. This starter is of the ironclad totally-enclosed, dust- and weather-proof type assembled in one case, thus minimising the space required. The stator circuit is controlled by a 3-pole contactor circuit breaker, while a face-plate starter is used to control the rotor circuit. The rotation of a handwheel first closes the stator circuit, and subsequent revolutions cut resistance out of the rotor circuit. A quick step-to-step movement is made between the rotor notches, and an

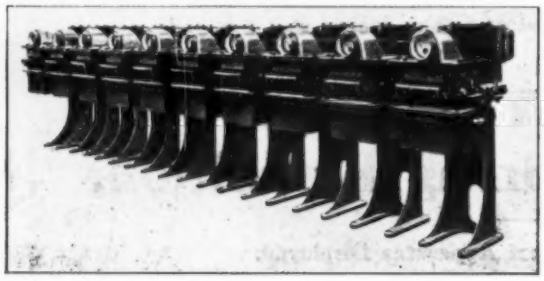

Fig. 3.—F.P. Flameproof Switches.

indicator shows which notch the starter is on. The operator does not have to make two distinct operations when starting a motor, and overload and no-volt protection is provided.

Messrs. Heyes & Co., Ltd., had a display of "Wigan" mining specialities, the newly-patented prismatic lamp-fitting being probably the outstanding feature of interest. It has been specially designed for use in low and narrow roadways, &c., and by means of the prisms the light is reflected over an area of 180 deg. from the plane of the fitting. It does not occupy any more space than the standard bulkhead fitting, and yet gives a normal front illumination with an increased side illumination up and down the roadways. The prismatic glass is of exceptional strength requiring no wire guard to protect it, with no consequent decrease of illumination. The fitting has explosion-proof joints, and the lampholder is already wired to connector blocks; it is fitted with one, two, or three armour glands, or screwed for tubing, and will not only be of use in mines, but also on board ship, in any place with low ceilings, subways, &c.

Messrs. Ferguson, Pailin, Ltd., exhibited representative types of switchgear generally used for mining purposes. Commencing with the larger sizes, such as could be used in the colliery power station or receiving sub-station, a metal-clad, compound-filled "ED" unit suitable for a duplicate busbar system was shown: selection of bus-bars is accomplished by an oil-immersed switch mechanically operated from the front and interlocked with the main oil circuit breaker, the current and potential transformers being accommodated in the draw-out portion of the unit and are oil immersed. Overhead transmission lines are now common in connection with colliery work, and an outdoor switch of the rocking type suitable for pole mounting and remote mechanical operation was on view. Whilst intended primarily for isolating only, it is fitted with arcing horns to enable the magnetising currents of small transformers to be broken; an outdoor oil fuse suitable for the protection of such transformers or sub-circuits was also shown. To deal with the heavy l.p. currents sometimes met with in mining work, a totally-enclosed type "C" unit has been designed (fig. 1). It is of the horizontal draw-out type, and a bus-bar adapting chamber can be fitted to enable the unit to line up with the standard "B" (fig. 3) and

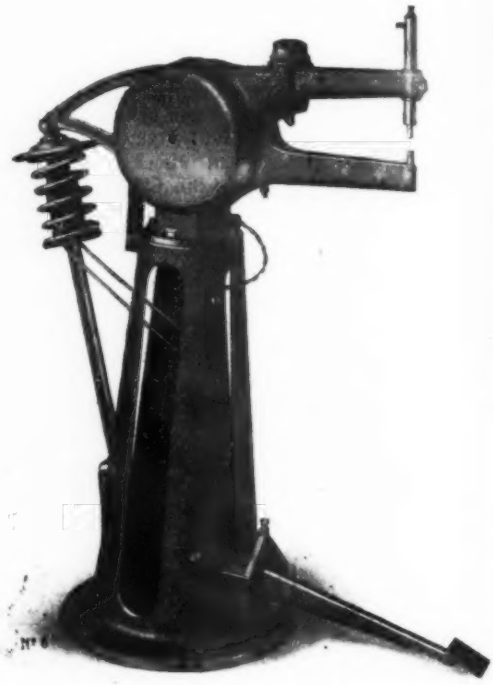

Fig. 4.—A New Process Co. Spot Welder.

"C" units, which are suitable for use in sub-stations both on the surface and underground. The control of sub-circuits and squirrel-cage induction motors is catered for by the "A" unit, which can be obtained in the following types:—Main switch, change-over switch, series-parallel switch, star-delta starter, and auto-transformer starter (fig. 2). These units may be made flameproof.

The New Process Co.'s recently-brought-out welder was to be seen on the stand of Messrs. Ogilvy & Co. The chief point is the attempt that has been made to eliminate the human element by the incorporation of an "Ermack" automatic current controller, which cuts off the current immediately the weld is completed. Variation in material thickness or surface oxidation does not influence the efficiency of the machine. Fig. 4 illustrates a spot welder, but the firm also makes seam and butt welders.

The Diamond Coal-Cutter Co., Ltd., had a fine display of cutters, jigging conveyors, and switchgear. The latest electric chain coal-cutter is driven by a 30-h.p. totally-enclosed motor, and the machine itself has a 15-in. cutting floor level, is 8 ft. 9½ in. in length and 2 ft. 3 in. wide, and two 2 tons 16 cwt. in weight. The electric jigging conveyor driving gear is a compact exhibit; varying lengths of stroke are arranged for, and the gear can be coupled to the troughing for direct end or under drives, or rope drive through a bell crank.

The Wolf Safety Lamp Co. and Federation Lamp Co. had a joint stand, with a comprehensive display of their products, including the Maurice-Wolf nickel-cadmium 2-c.p. mine lamps with removable battery covers.

(To be concluded.)

Belt and Rope Driving.

The Attendant Pull on the Shaft.

By W. R. NEEDHAM.

THE writer has known of cases of shafts breaking down almost immediately outside the journal at the driving end of an overhung belt pulley machine. When the stresses came to be calculated more carefully after the mishap, it was found that the bending stress alone was at least 10,000 lb. per sq. in—probably upwards of 11,000 lb. per sq. in. This is much too high a figure for the ordinary shaft material used, especially having regard to the alternating nature of the bending stresses (two reversals for each revolution), and to the fact that shear stresses due to driving torque co-exist.

The object of the present short notes is to express the pull on the shaft due to belt and to rope driving respectively in convenient form. It is one of those simple calculations, which are yet tricky; and mistakes have been made which a little thought and some application of first principles would have obviated.

It is well known that the effective force F transmitted by a belt $= T - t$ lb., where T is the force in lb., on the tight or driving side, and t is the force, in lb., on the slack side. Consequently, the horse power transmitted $= (T - t)V/33{,}000$, where V is the belt velocity in feet per minute.

Thus $T - t = F = 33{,}000 \times$ horse power/V lb. .....(1)

Also $T/t = e^{\mu\phi}$ or $\log T/t = 0.4343\ \mu\phi$.....(2)

where μ is the coefficient of friction for belt and pulley, ϕ is the belt included angle (in radians); and e is the base of natural or Napierian logarithms ($= 2.718$).

The value of μ for leather on cast iron is approximately .3 for ordinary velocities, though it is doubtful whether a really close figure can up to the present be given. The angle ϕ is usually round about 180 deg. (π radians) for most cases one is up against. It may reasonably enough be taken at that figure, especially for open drives.

Thus, from (2), $\log T/t = 0.4343 \times .3 \times \pi = .4095$; whence $T/t = 2.567$; $t = T/2.567$; and $T - t = (2.567 - 1)T/2.567 = 0.611T$, where $\mu = .3$, and $\phi = 180$ deg.

In this case, therefore, (1) becomes $F = 0.611T = 33{,}000 \times$ h.p./V lb.; $\therefore T = 54{,}000 \times$ h.p./V lb. .....(3)

and $t = 0.389T = 21{,}000 \times$ horse power/V lb.....(4)

Now (3) and (4) can be expressed in possibly a more convenient form. If N be the speed in revs. per min., and R the mean radius of the belt (in inches), then $V = 2\pi RN/12$ .....(5)

Substituting, we obtain

$T = 103{,}100 \times$ horse power$/R \times N$ lb.....(6)

$t = 40{,}100 \times$ horse power$/R \times N$ lb.....(7)

Similarly, $F = 63{,}000 \times$ horse power$/R \times N$ lb.....(8)

Now, the pull P on the shaft, with which we are principally concerned $= T + t$ lb. $= (3) + (4) = (6) + (7)$.

Thus $P = (54{,}000 + 21{,}000)$ horse power/V $= 75{,}000 \times$ horse power/V lb.....(9)

$= (103{,}100 + 40{,}100)$ horse power$/R \times N = 143{,}200 \times$ horse power$/R \times N$ lb. .....(10)

Reference to fig. 1 should assist any reader who may find the explanation lacking in clarity.

The effective rope pull in a rope drive is of the same general order of things as the belt pull we have just considered.

Here again $F = T - t = 33{,}000 \times$ horse power/V lb....(1)

F in this connection can apply either to the force *per rope*, or the force for the complete pulley installation.

In order, however, to avoid any confusion we will take F as the effective force *per rope*. Thus in what follows horse power means horse power per rope.

Here, as in the case of belts, we can put $\log T/t = 0.4343\mu\phi$ (2), if we regard μ as an equivalent coefficient of friction. The value of this equivalent μ depends directly upon $2R$, and $2R = (T - t)\sin\theta$, where θ is half the groove angle (in degrees). Reference to fig. 2 should help to elucidate matters.

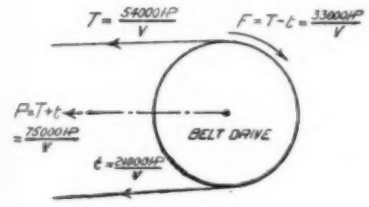

Fig. 1.

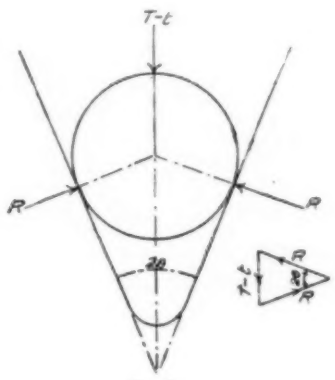

Fig. 2.

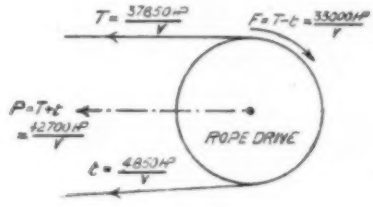

Fig. 3.

Thus, when the groove angle $2\theta = 40$ deg., $2R = 2.926\ (2 - \phi)$; and when $2\theta = 45$ deg., $2R = 2.616\ (T - t)$.

Accordingly, if the real coefficient of friction for rope on iron be, say, 0.25, then the equivalent μ for a groove angle of 40 deg. will be $2.926 \times 0.25 = 0.731$, and for 45 deg. it will be $2.616 \times 0.25 = 0.654$.

By taking ϕ for general purposes as π radians, and 2θ as 45 deg., we ought to be sufficiently near the mark for ordinary calculations. All we need to remember is that where greater accuracy is required we must correct our values of ϕ, θ, and μ to suit. On these assumptions then we put

$\log T/t = 0.4343 \times .654 \times \pi = 0.892$;

whence $T/t = 7.798$; say, 7.80.

Consequently $t = T/7.80$; and $T - t = (7.80 - 1)T/7.80 = 0.872T$.

In this case, therefore, (1) becomes

$F = 0.872T = 33{,}000 \times$ horse power/V lb. per rope;

$\therefore T = 37{,}850 \times$ horse power/V lb. per rope. (11)

and $t = 0.128T = 4{,}850 \times$ horse power/V lb. per rope. (12)

Then P, the pull on the shaft, $= T + t$ lb. $= (11) + (12)$,

$= (37{,}850 + 4{,}850)$ horse power/V $= 42{,}700 \times$ horse power/V lb. per rope..... (13)

If there are n ropes, then P = total $42{,}700\ n \times$ horse power/V lb.....(14)

Expressing T, t, and P in terms of $R \times N$, where R is the mean radius of rope in inches, and N is the speed in revs. per minute, we obtain

$T = 72,300 \times \text{horse power}/R \times N$ lb. per rope.....(15)

$t = 9,270 \times \text{horse power}/R \times N$ lb. per rope.....(16)

$P = 81,570 \times \text{horse power}/R \times N$ lb. per rope.....(17)

and P total $= 84,570\ n \times \text{horse power}/R \times n$ lb.....(18)

Fig. 3 illustrates diagrammatically the pull P, as compounded of its component rope forces T and t.

Mr. R. Livingstone, in his valuable book on "Mechanical Design and Construction of Generators" (now unfortunately out of print), gives P for belt and rope driving respectively. In the former case he assumes t to be half T, and in the latter t to be one quarter T. Consequently, corresponding to (9), P for belt drive is $99,000 \times \text{horse power}/V$ lb.; and corresponding to (13), P for rope drive is $55,250 \times \text{horse power}/V$ lb.

The values given in this contribution are a compromise between Livingstone's and those which Goodman's "Mechanics Applied to Engineering" would seem to favour. The late Prof. Perry, in his "Applied Mechanics," suggests for belts that $\mu = .3$, and for ropes an equivalent .6. Thus, values deduced therefrom would agree fairly closely with those tentatively offered in this article.

The actual calculation of horse power transmitted by any specific belt section or rope is really outside the scope of the present short contribution. The effect of centrifugal force on the material has to be considered. For ordinary purposes, however, the tabled data to be found in any reliable handbook can be worked to with reasonable confidence.

A "Relay" Automatic Telephone Exchange.

A "Cut Over" in an Admiralty Establishment.

On June 23rd there was "cut over" at one of H.M. naval establishments a "Relay" automatic branch exchange (p.a.b.x.), which is at present equipped for 550 lines. This exchange, which, we understand, is the largest automatic telephone installation in any British naval establishment, is interconnected with a 50-line "Relay" automatic exchange (p.a.x.) which was

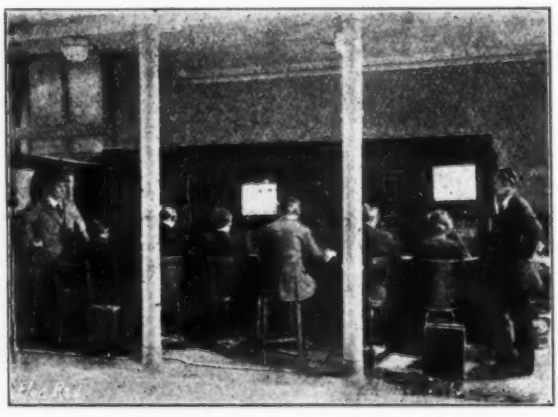

Fig. 1.—Old 6-position Manual Board.

brought into service at a subsidiary establishment some weeks previously. The large p.a.b.x. has been installed in a newly-erected telephone building, and has replaced a six-position manual board (fig. 1), which was originally a two-position board installed in 1907, four positions having been added subsequently. Eleven operators in three shifts and one supervisor were employed on this equipment.

The "Relay" p.a.b.x. (fig. 2) is fitted with a two-position manual board, the subscribers' jacks being arranged in three panels; the operator, therefore, has ready access to any subscriber's jack. The manual board is used only for calls to the public exchange, and as such calls amount to only one per cent. of the total traffic (the other 99 per cent. being dealt with entirely automatically by the "Relay" plant), it has been possible to give a much more efficient outside service and, at the same time, to dispense with nine of the operators necessary under the previous system.

The commander-in-chief and all establishments, such as the engineers, central offices, workshops, main offices, barracks, cashiers, and police, are linked up by an entirely automatic service which effects its connections day or night in three seconds, while two very important distant stations are connected by the switchboard, which also serves all vessels in the harbour. Some of these lines are three miles from the automatic exchange, and the 50-line subsidiary automatic exchange employs no operator whatsoever. Facilities are provided through the large exchange for any 16 officials to hold a con-

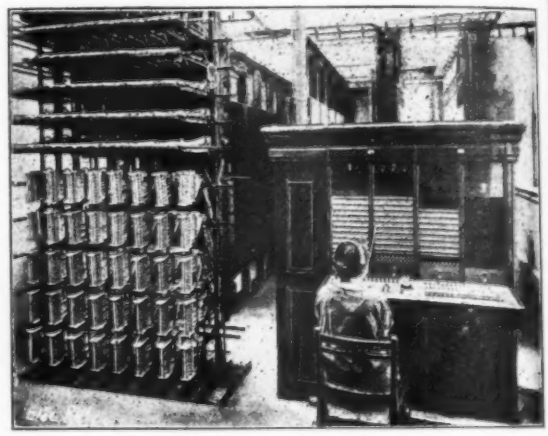

Fig. 2.—"Relay" Automatic Branch Exchange.

ference, and three officials have priority of service, while on the subsidiary exchange three high officials have the same privilege.

The exchange is similar to the "Relay" equipment supplied to the British Post Office, with standard dialling, ringing, and "busy-back" tones. Provision is made on the large exchange for 10 two-party lines with selective ringing; alarms to indicate exchange faults are provided and, according to the nature of the fault, either a delayed or instantaneous signal is given, depending on the importance of the fault.

The 550-line exchange is equipped with two sets of Chloride batteries of 340 ampere-hour capacity, both exchanges, by the way, being of the latest 32-volt model. Two ringing machines are fitted in the 550-line exchange, one of which runs off the 220-volt mains and the other off the exchange battery; the 50-line subsidiary exchange is also equipped with duplicate ringers.

Gas Firing at Dalmarnock.—Ex-Bailie W. B. Smith, Convener of Glasgow Corporation Health Committee, read a paper on "The Smoke Problem Solved" at the Royal Sanitary Institute Congress at Edinburgh last week. Having explained the initiation of the plant at the Dalmarnock gas works, now nearing completion, for the production of smokeless fuel and industrial gas by the Maclaurin process, Mr. Smith said that after the plant at the gas works had been working long enough to give them the experience necessary, they would at once consider putting down plant at the electricity generating station to carbonise about 500,000 tons of coal per year, to supply gas to fire all the boilers there, and produce 275,000 tons of smokeless fuel for the use of the citizens; 7,800,000 gallons of oil would be obtained from their own coal, instead of having to be purchased from abroad. They would also consider putting down plant to supply gas to works and factories in the area, and plant in the gas works at Provan to supply Maclaurin gas in the great industrial area adjoining it. There were those, Mr. Smith added, who did not see much necessity for Government help, except in special cases; most local authorities owning gas works or electricity stations could install the system themselves on a paying basis as a sound commercial proposition.

Legal.

Gas and Electric Securities, Ltd.

MR. JUSTICE EVE, in the Companies' Winding-up Court, on July 21st, heard the petition of the Northern Exploration Co., Ltd., for the compulsory winding up of Gas & Electric Securities, Ltd. Counsel said it was the petition of an unpaid judgment creditor for £17,000; no notice of opposition had been given.

His LORDSHIP said that he saw that the company had a paid-up capital of £2, but Counsel could take the required order.

The usual winding-up order was accordingly made.

Strand Electrical and Engineering Co., Ltd., v. Gee.

MR. JUSTICE ROCHE heard in the King's Bench Division, on July 22nd, an action by the Strand Electrical & Engineering Company, Ltd., Floral Street, Covent Garden, against Mr. Hugh Gee, South Kensington. Plaintiffs claimed £310 7s. 11d. balance of an account of £409 17s. 11d.

MR. VAN DEN BERG, for plaintiffs, said the issue was whether credit was given to Mr. Gee or, as he alleged, to the Gee Construction Co., Ltd., which was now insolvent. The work claimed for was done in April last in connection with what was known as the Wembley airship, which was invented by Mr. Gee. The plaintiffs had never heard of the Gee Construction Company until long after the work was done. A sum of £49 10s. was paid on account by the company's cheque, but the plaintiffs did not pay any particular attention to the circumstance that the cheque was the company's. A second payment of £50 in cash was made by Mr. Gee.

Mr. PHILLIP SHERIDAN, general manager of the plaintiff company, giving evidence in support of the claim, said that Mr. Gee was a decorative artist and designer and the plaintiff company had done work for him personally before this particular work was undertaken. Mr. Gee had never mentioned the company.

Mr. GEE said that previous to this plaintiffs had done work through him for Barker's and other people but not work for him personally. He had not sufficient money himself to have this invention used at Wembley and formed a company with a capital of £2,000. Most of that sum was subscribed. He told Mr. Sheridan of the formation of the company, and the latter admitted the debt.

His LORDSHIP said the defence had been established to his satisfaction. Judgment was therefore entered for defendant with costs.

Coley v. Plum.

AT the Torquay County Court on July 22nd, before his Honour Judge Higgins, Mr. S. C. Coley, an electrical engineer, sued Mr. A. J. Plum, proprietor of the Hotel Regina, Torquay, for £16 6s. in respect of radio apparatus supplied. The defendant counterclaimed £32, the amount paid for a radio installation which, he alleged, had wholly failed.

Counsel for the plaintiff stated that his client originally installed a "Burndept" set in the defendant's premises, but at defendant's request he replaced it with a four-valve set of local make. This set was demonstrated to him and he agreed to purchase it for £32. That was in November last year and no complaint had been received until the end of April this year; in fact, defendant had written and expressed his appreciation of the set. If the set was properly operated it worked entirely satisfactorily.

WALTER HUME, employed by the plaintiff, said that he had tested the set and found it satisfactory. The witness agreed with the defendant's counsel that the set should be capable of receiving from all the British broadcasting stations. The plaintiff said that he had received no complaints about this kind of set apart from that of Mr. Plum.

His HONOUR gave judgment for the plaintiff for the amount claimed and costs, and for the defendant on the counterclaim for £16 and costs.

P. D. Mitchell, Ltd., v. British Insulated & Helsby Cables, Ltd.

THIS action came before Lord Morison in the Scottish Courts recently. The plaintiffs, metallic cask makers and oil refiners, claimed the sum of £2,800 as damages for breach of contract in respect of the supply of electric welding machines, while the defendants counterclaimed for the cost of goods supplied. The plaintiffs stated that they received from the Helsby Company a spot welder, a seam welder, two circumferential welders and some jigs. They complained that these machines did not operate satisfactorily, but the suppliers replied that the plant was quite suitable for the work if it was properly handled. His Lordship held in favour of the plaintiffs, but considered the amount of their claim extravagant. He awarded them £550 as damages for breach of contract and "assoilzied" them from the conclusions of the summons in the counterclaim. In giving judgment, his LORDSHIP said that the contract between the parties implied a warranty that the machines would efficiently weld the seams of the drums made by the plaintiffs and permit of an output of 2,000 per week. The thickness of the material employed was, however, beyond the capabilities of the machines and their efficiency was impaired by overheating. He considered that Messrs. Mitchell were entitled to reject the machines as they did not fulfil the conditions of the contract.

Gas Engines and Electricity Supply.

Some Views on the Power Supply Question.

ONE of the papers read at the annual meeting of the Institution of Gas Engineers in London on Thursday, June 11th, was by Sir Dugald Clerk, F.R.S., and it dealt with gas for motive power. One of the purposes of the paper was to show that it was possible for the gas industry to capture a large quantity of business from the electricity supply industry by inducing manufacturers to install gas engines upon their premises to generate electricity, in preference to taking supply from the public mains, the contention being that it was cheaper in many cases to do so when the average price paid for lighting and power was taken into account. Sir Dugald Clerk, who is well known, of course, as a director of the National Gas Engine Co., stated that electric light and power companies were pressing hard to supply motive power, and a certain field would doubtless always be theirs. For powers up to 5 or 6 h.p., occasionally used, no doubt they would find a considerable field; but if equal pressure were applied by gas companies, in conjunction with gas-engine manufacturers, he was convinced that the electricity companies would be prevented from seriously invading the field of larger powers. Even the very small gas power trade might be held against the electricity companies if gas companies would combine to let out gas engines on hire in the same way as they so commonly dealt with gas stoves. The electricity supply companies adopted similar methods; and there seemed to be no good reasons why the gas companies should not fix gas engines in the same way as the Tyneside Electric Supply Company, in Newcastle, fixed motors—either on simple hire or else on the five years' purchase system.

In the discussion Mr. P. D. WALMSLEY (Great Yarmouth), after agreeing that in many industries, such as weaving and textile industries, electricity was essential owing to the advantages which followed from the use of motors on individual machines, urged the necessity for concentrating upon a consideration of the cost of generating electricity in such factories by means of gas engines. Whereas the average cost of generating electricity throughout the country was about 1.9d. per unit, there were many instances in which energy was being sold for 1½d. per unit for power purposes. In such cases he recommended gas engineers to inquire from these power users the average price they were paying for lighting and power, because it would more often than not be found that, in view of the high price charged for electricity for lighting purposes, it would pay these manufacturers to put down their own gas-engine-driven electricity generating plant.

Mr. S. SHADBOLT (South Bank, Yorks.), said the paper emphasised the absurdity of the methods adopted by the electricity supply industry in charging for electricity. On the North-East coast there were super-power stations interlinked with distribution systems which, he ventured to think, were a great deal more to be feared by the gas industry than anything the Government was likely to promote. Electricity supply undertakings were fleecing the lighting consumers in order to undercut the price to get the power load. At the same time it must be remembered that it was not always a question of cost which determined the use of gas or electricity; he was constantly finding that the convenience and adaptability of the electric motor played an important part.

Dr. E. W. SMITH (Woodall-Duckham Co.), urged gas engineers not to assume that the electricity supply industry was not moral because it adopted the methods of charging which it did. It was time that the gas industry started an inquiry to consider the best commercial methods of selling gas. Personally, he was quite sure that a very good case could be made out for selling gas for power purposes at cheaper rates than it was supplied at for lighting purposes.

The PRESIDENT pointed out that under their Acts of Parliament gas companies were prevented from making a reduction of more than 25 per cent. in the price charged the industrial consumer as compared with domestic consumers.

SIR DUGALD CLERK, replying to this part of the discussion, agreed that separate electric motors were frequently an enormous convenience, so much so that the National Gas Engine Co. used them, although it generated the electricity itself by means of gas engines. He agreed with Mr. Shadbolt that it was a pity that lighting consumers should be penalised by the electricity supply industry for the sake of the power consumers, and that it would be better if that could be avoided. At the same time as had been indicated by Dr. Smith, if some inquiry could be instituted into the division of the costs of manufacture in the gas industry, it would be possible to charge much lower prices for gas for power purposes than for domestic purposes.

"Wireless" Transmission of Energy.—According to one of our Italian contemporaries some interesting experiments have lately been carried out in Milan by Signor Narciso Midali in connection with the "wireless" transmission of electrical energy, when a receiving station succeeded in picking up 50 per cent. of the power transmitted. Signor Midali is continuing his experimental work.

E

Reviews.

The Law Relating to Public Service Undertakings. By F. N. KEEN, LL.B., Barrister-at-Law. Pp. xii + 320. London: P. S. King & Son, Ltd. 1925. Price, 15s. net.

This book is one of the monographs published in connection with the London School of Economics, and is based on a course of lectures delivered there by the author.

The "public service undertakings" specially considered include: Water, gas and electricity supply, land drainage and irrigation, markets and fairs, and hydraulic power. Transport services are excluded, the author thinking that their special features are best dealt with separately.

The characteristic of "public service undertakings" which interests the author is: "that the undertaking has such a degree of importance or involves such difficulties in execution as to justify the placing of those who undertake it in a position of special privilege within the community or the conferring of special powers upon them."

As these special privileges and powers mean generally that the "undertakers" are permitted to do things otherwise illegal, to interfere with the general rights of property within certain limits of locality and time, they are given some kind of monopoly rights in return for the assumption of some duties and obligations towards the community within their field of action; for the benefit of that community the undertakings have to be established and conducted under special laws, in respect of which there has developed a code of procedure, general principles, and precedents, partly statutory, partly administrative, partly judicial, and partly regulated, *e.g.*, by the Standing Orders of the two Houses of Parliament, differing in some respects for each class of undertaking, of which it is necessary for those who wish to engage in such undertakings, and those who have to administer them, to have a general knowledge. The imparting of this general knowledge with the addition of the more important detail conditions, is the author's object. It is an object which he can be congratulated upon having achieved to a satisfactory and useful degree.

The first eight chapters cover subjects of general application, the general code of procedure and principles obtaining in this country, under the headings, "A Preliminary View" (including the methods of obtaining the legal powers for the establishment, and the general scope of the regulations accompanying the powers, of the undertakings); "The Scope of Purposes and Powers," "Land Works, and Compensation," "Duties and Obligations," "Capital and Revenue," "Rating and Income Tax" and "Sale, Lease, Winding-up and other matters."

The third of these chapters deals very clearly with the provisions under which public service undertakings are permitted to take land by compulsory process, and in various other ways to invade the general rights of property. It gives a concise account of the procedure, from the first stage of notices, &c., up to the various methods of determining the compensation to be made to the parties whose properties and/or amenities and interests are taken or affected; and the legal principles upon which compensation is assessed. The chapter is mainly an exposition of the provisions of the Lands Clauses Acts, 1845 to 1895; the variations of these provisions as incorporated in, or applied to, special Acts of various kinds; and the constructions of the Acts established by decisions of the Courts. This is a very useful and informative exposition of an intricate matter of the first importance.

The eight general chapters give a good bird's-eye view of the position of public service undertakings before the law; the manner in which Parliament has ordained that they may be established; the general principles governing their privileges, powers, duties, obligations and rights; with illustrations of the way in which the Courts have applied these principles and construed particular provisions.

The remaining six chapters are devoted each to one of the particular classes of undertakings above mentioned. The relevant general Acts and Clauses Acts are summarised; the procedure for obtaining powers indicated and a general view given of the scope and character of the particular powers granted and the corresponding duties and obligations.

It is significant that by far the longest of the six chapters is that referring to electricity supply. Although the youngest of the industries dealt with, it operates in a tangle of legislation more involved than that regulating any of the others. As this is the subject of chief interest to the readers of the ELECTRICAL REVIEW, it has been read with particular care. There is very little to criticise. It is a clear and full statement of the general legislation, with a sufficient reference to the nature and scope of variations in special cases for which there are precedents. The general effects of the more recent Acts, of 1919 and 1922, are set out as fully as can be expected, considering that the concrete results of those Acts are still very much in embryo, which is a good reason for cautious treatment by a lawyer. The two London Acts of 1908 and 1910 are not mentioned, but the author probably thought these of purely local interest.

Quite logically the author mentions in his descriptions of specific provisions of the various Acts, the alterations by repeal, amendment, and substitution, made by later Acts; but in describing the later Acts usually passes over the amending and repealing provisions in silence. This is a little inconvenience to the use of the book for reference. One definite omission of reference to an amendment is that of the date to which annual accounts are to be made up in Section 9 of the E.L. Act, 1882.

The summary of the Clauses Act of 1899 is particularly useful. That Act has always seemed to the reviewer an extraordinary difficult one to memorise and to find one's way in. The author's summary is quite helpful, and it is an important Act to everyone responsible for the conduct of electricity supply.

The Section defining the supply powers of a power company (pp. 253-254), if correctly quoted from any Act, is unusual in permitting a power company's consumer within the area of supply of an authorised distributor, to use as much energy for lighting as for power. Generally the lighting proportion is limited to 20 per cent. of the total supply.

The general style is clear and easy to read, but would have been improved by eliminating the occasional personal form of address ("you will remember," "you will see," &c.), derived from its original lecture form.

The book is a very useful one, remarkably free from divagations into legal and procedure technicalities, and consequently of the greater value to the layman who wants guidance in the general matters of promotion and conduct of undertakings which are necessarily outside the general law in certain respects.

Circuit Troubles and Testing. By TERRELL CROFT. Pp. x + 224; figs. 237. London: McGraw-Hill Publishing Co., Ltd. Price, 12s. 6d. net.

Probably we should all welcome the wireman or fitter, &c., who could produce a fault-proof installation, but our ideal must be one who after getting as near to the fault-proof installation as possible, will be able to locate with accuracy and speed and repair effectively the fault when it does arise. The book should prove of great value to all employed on the installation of any class of electrical equipment and will no doubt be welcomed by many electrical workers of all grades. The book commences with descriptions of many of the simpler testing devices leading up to the more advanced instruments and their application in many methods of testing and fault localising on distribution systems, including both overhead and underground cables, and installations of all descriptions.

The author forcibly draws attention to the necessary application of different tests to different classes of cables and installations. The Wheatstone-Bridge and Slide-Wire tests, and modifications of both, are extensively dealt with, while the simpler galvanometer and various fall of potential tests are dealt with in their respective cases. The author deals very briefly with the question of faults on motors; this is rather a pity, because the practical man's need for advice in connection with fault locating is probably more acute in the case of faults on motor windings, or machines of that family, than in the case of ordinary installation wiring faults, in virtue of the apparently complex character of such faults and their inaccessibility.

Some miscellaneous factory tests such as the testing of porcelain insulators, &c., add to the general interest of the book.

Theoretical and Applied Electrochemistry. By MAURICE DE KAY THOMPSON, Associate Professor of Electrochemistry in the Massachusetts Institute of Technology. Revised Edition. Pp. xviii + 551; figs. 218. New York and London: The Macmillan Co., 1925. Price, 20s. net.

The object of this volume is to give an account of the most important electrochemical industries, together with the principal applications of electrochemistry. The book is an important manual on the subject, the technique described being of a very high order. The great strides within recent years which have been made in this domain of chemistry, make the appearance of this volume timely and opportune. The present edition of this valuable work has been completely revised; a section on the theoretical aspects of the subject is added. Le Blanc's "Lehrbuch der Elektrochemie (1922)," and Foerster's "Elektrochemie wässeriger Lösungen (1922)," having been largely drawn upon.

The subject matter is divided into three parts; the first is "Theoretical," dealing with Faraday's laws, electrolytical dissociation, ionic theories, electro-osmosis and polarisation. The second part contains an account of the "Applied Electrochemistry of Aqueous Solutions," dealing with the construction of electrolytic cells, electroplating, the electrolytic extraction and refining of metals, electrolytic oxidation and reduction, and the construction and uses of storage cells. The third part deals with "Electric Furnaces and their Products," comprising sections on the products of resistance and arc furnaces, electrothermic reduction processes, fixation of atmospheric nitrogen and the production of ozone.

The electrochemical industries are of great and widespread importance, not only by reason of the capital involved, and the numbers to which they give employment, directly and indirectly, but also for the important part they have played in the development of various countries. They have of necessity called forth an abundant technical literature provided by experts of acknowledged eminence, all urging the desirability of extending the applications of electrochemistry. The contribution of the author in this volume, is a discussion of the subject from the theoretical and technical point of view separately, and the general industrial applications of electrochemistry. Throughout the whole work the industrial applications are kept in the foreground, and the chain of theory serves to link the indus-

trial processes into one coherent whole, giving a well informed survey of the subject. The treatment of the generalised theory is excellent; a great deal of scattered work is here brought together, and welded into a logical development. The volume shows a wide practical knowledge, and persistent endeavour to bring together the knowledge of the scientist and the skill of the industrialist, to give practical application to theoretical principles and new discoveries. In a science of such recent and rapid growth as electrochemistry, the methods of presentation are not so stereotyped as in the older sciences, and vary considerably with different authors; but this volume will serve as a model for future writers on the subject.

The volume under review is never tedious; the author's statements are always strictly relevant; they keep each subject well in view, and thus retain the reader's interest. The general excellence of the book is worthy of great praise, being a genuine attempt to elucidate the broad principles of the subject in the light of our present knowledge, and invaluable from the point of view of suggestive matter. The volume can be warmly recommended, particularly to those who, from the fact that the first edition has been out of print for some time, may be unacquainted with the merits of what may be still regarded as one of the standard treatises on the subject.

The book is far from being a mere compilation, for it is evident that the author has a first hand knowledge of the subject and also has devoted considerable energy and zeal to the undertaking. The description of processes are clear and concise, and are well illustrated with diagrams and sketches of the different types of plant employed.

The Elements of Railway Economics. By Sir WILLIAM M. ACWORTH, K.C.S.I., M.A. New edition revised and enlarged by the author and W. T. STEPHENSON, B.A. Pp. 216. London: Oxford University Press. Price 3s. 6d. net.

It is an uncommon and rather sad experience to have to review a book coincidently with the announcement of the death of the author. Sir William Acworth had attained a professional reputation maintained by untiring useful activities up to a ripe age, placing him among the worthily fortunate of his time.

The book is a new edition of a work already well known and esteemed revised with the assistance of Mr. W. T. Stephenson, and brought up to date with respect to the changes in British railway organisation since the war, and the Railway Act of 1921. It is in these respects a new book, one which is indispensable to the student of the important subject matter, and to traders and others who need some knowledge of the underlying principles of railway charges and cognate matters. Its moderate price is a rare virtue nowadays.

Taking a broad view, the book is an explanation of the way in which railway charges are determined, with a short historical sketch from the early days of canals. It takes the standpoint that a "cost of service" basis is inapplicable, with the consequence that "what the traffic will bear" or "value of service rendered" principles have to be applied, with, however, numerous modifications due to, *e.g.*, the existence of competing transport agencies, special circumstances of individual trades and traders.

The author prefers "what the railways can bear" to "what the traffic can bear"; *i.e.*, the minimum rates which the railway can accept as reasonably remunerative, rather than the maximum which can be tolerated by the parties served. The substitution has a better face value. The older phrase has a somewhat predatory tone, which the author endeavours to prove unjust, with some success.

The principal argument against a "cost of service" basis is that it is impossible to separate from the costs and charges of a railway, the true cost of any particular class of traffic. This argument is supported by a number of sample railway revenue accounts, British and American. These differ in the amount of detail, the American forms being the fuller. They justify the author's contention that from the accounts of a single accounting period it is not practicable to allocate costs and charges to specific classes of traffic completely.

This argument seems to be open to two criticisms; first that the forms and details of the accounts might be altered to give more information; secondly, that even with the accounts as they are, some information can be gleaned by the comparison of costs over different periods with different proportions of various classes of traffic.

The author's phrase "what the railway can bear" implies some evaluation of costs, for clearly the railway cannot "bear" rates of charge which do not cover costs and provide some return upon capital. Again, it is shown by numerous instances that different classes of goods carried entail specific costs which are allocatable. A railway cannot in reason make identical charges for carrying ten tons of coal, and ten tons of chilled beef, or ten tons of straw hats or furniture, the same distance. The ton-mile basis of charge is not commercially practicable as between different classes of goods; as between goods and passengers it is hardly more absurd.

The real difficulty of the "cost of service" basis seems to be the very large proportion of total costs and charges of a railway which have to be met independently of the amount of traffic, or the proportions of different classes of traffic handled; and—in a lesser degree—the difficulty of finding a common denominator for the services rendered. The reviewer is not convinced, however, that the costs and charges not definitely allocated might not be reduced to more manageable proportions by the application of "cost accountancy" methods. The obvious process is to allocate the specific costs of each class of traffic. When this is done to the fullest practicable extent it may appear that the non-allocatable portion is not so great as is now assumed.

The Railway Rates Tribunal set up by the Railway Act has to see that rates and fares as a whole are so adjusted that the railways can, with economical and efficient management, earn a sum equal to the net revenue earned in 1913, plus an allowance for interest on additional capital expenditure, and 20 per cent. of any economies effected—80 per cent. of the economies going to traders by way of reduction of rates. It also has to consider individual "exceptional rates and fares", and individual complaints as to rates. It may at some time have to distribute increases or decreases of costs among the various classes.

It is difficult to see how these functions can be carried out equitably without inquiry into costs and their allocation; so the legislature has laid upon the Tribunal a task which can only be accomplished by a process which the author thought hardly possible. The necessity may evolve the methods.

The book is written in an admirably lucid style, and cannot fail to interest and inform the careful reader. Whether agreeing or not with all its conclusions, the reader will thank the author for a clear exposition of an intricate subject, and regret that his great store of knowledge and capacity for applying .. is no longer at the service of the community.

In Mr. Stephenson, one ventures to hope, he has a capable successor.

The History of the Telephone in the United Kingdom. By F. G. C. BALDWIN, M.I.E.E. Foreword by F. GILL, O.B.E., M.Inst.C.E., M.I.E.E. Pp. xxvi + 728. Figs. 186. London: Chapman & Hall, Ltd. Price, 42s. net.

It is a long cry from "Mr. Graham Bell" of 1876 to the "Dr. Graham Bell, LL.D., Ph.D., D.Sc., M.D.," of 1922, the year of his death; yet the long interval between those dates represents the birth and growth of telephony in this country; and the distinctions added to the name indicate the importance of the practical application of electricity in the transmission of speech made by this great pioneer in what has become an indispensable necessity in our social and industrial life. Looking back over this long interval of years the writer can remember the intense excitement of listening to speech, badly cut up by inductive disturbances in those early days, and of comparing it mentally with a recent experience when he listened on a line equivalent in length to the distance between New York and San Francisco to flawless conversation carried on without any more noticeable diminution of intensity than if it had been received from a speaker a few miles distant!

In this exhaustive work of Mr. Baldwin's we have the records of those brilliant achievements, both in individual effort and organised industry, that have contributed to the attainment of the wonderful efficiency of our telephonic system of to-day.

A good deal of space is given in the earlier part of the book to the litigation between the Post Office and the telephone companies in connection with infringements of the rights of the P.M.G., and to the early disputes in connection with the infringements of patents held by the United Telephone Company.

The first three chapters may be taken as presenting the advances in telephony in a sequent order; but from this point onwards the author departs from the method in order to give prominence to the commercial and technical aspects of the subject as these develop. One chapter is wholly devoted to the legislation which, as the author truly says, has exercised such an important influence on the development of telephony in this country.

It is not possible in a review, such as this, to make more than a general reference to those chapters dealing with the methods of switching, and to the associated appliances which have been evolved to meet the progressive requirements; it will be sufficient to say that nothing essential has been omitted in tracing the growth of the organism up to the highly complex form in which, as represented by automatic telephony, we find it to-day.

In addition to its great utility as a work of reference for those interested in the historical development of telephony, the book has a readableness which one would not expect to find in a volume of this description, and the author is to be congratulated on this embodiment of what must have been a long and laborious task.

The work appears to be free from any typographical or other errors, but on page 649 it is stated that a transmitter of the condenser type "consists of two discs arranged in the *same* plane, one rigid the other of steel which serves as a diaphragm, and is free to vibrate in *front* of the other"—a statement which is not quite in accordance with Euclidean geometry!

Electrical Terms in the French Language.—In November last the Academie Française declined to admit to the standard dictionary as French words, the terms "Electrification" (noun) and "Electrifier" (verb). As a result, however, of the protests of the French electrical press against the decision, the Academie has, we learn, agreed to consider the matter.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

The Yorkshire Agricultural Show.—A notable feature of the Yorkshire Agricultural Show, held at Bradford from July 22nd to 24th, was the considerable number of exhibits of farm, garden and domestic machinery and appliances driven by electric power. Displays of household electrical fittings were made by Messrs. Taylor & Parsons, Ltd., Bradford; Messrs. C. W. Lillie, Leeds; Messrs. Smith & Hardcastle, Bradford; and Messrs. Henry Wilson, Ltd., Bradford and Birmingham. Radio equipment was exhibited and demonstrated by Messrs. Taylor & Parsons and Messrs. E. Farnell & Sons, Birkenshaw, Bradford.

A Westinghouse-Siemens-Schuckert Agreement.—It is reported from Berlin that an agreement to run for ten years has been lately effected between the Siemens-Schuckert Werke Gesellschaft and the Westinghouse Electric and Manufacturing Co., Pittsburgh, U.S.A., for an interchange of technical and production methods and for the use by either company of any patents belonging to either of the concerns. The agreement applies purely to technical matters and in no way affects either concern from a commercial point of view.

Electric Transport at Wembley.—In addition to having one of their vans working in the Exhibition grounds, Messrs. Walker Vehicles, Ltd., are now opening a stand in the Palace of Housing and Transport at Wembley and exhibiting the "Walker-Electric" balance drive axle. They are further showing photographs illustrating some of their vans operating in this country.

Safeguarding of Industry.—At a largely attended meeting of Birmingham and Midland manufacturers at the Queen's Hotel, Birmingham, at which many trade organisations were represented, a resolution, proposed by Mr. P. J. Hannon, M.P., and seconded by Sir Herbert Austin (Austin Motor Co.), was carried, calling upon the Government to take immediate steps to bring into operation its promises to afford relief to depressed British industries. This resolution was not, it was explained, an attack upon the Government; it was to give expression to the general feeling of disappointment in the minds of the manufacturing and business community that the present Government had not undertaken its obligations, as made in election promises, as rapidly and effectively as everybody expected. The points that were voiced by Mr. George Terrell (President of the National Union of Manufacturers), who presided, and in the discussion, were that the present unsatisfactory state of industry was due to unfair competition from abroad, and the high cost of production at home. It was stated by Mr. Hannon that before long there would be a great national movement, inaugurated on behalf of manufacturers and traders generally, with the object of proclaiming that the only remedy for depressed British industries was a careful system of protection. Resolutions were passed insisting that any industry which came under the Trade Boards Act should be deemed to come within the definition of a substantial industry under the Safeguarding of Industries Act; and that, in the event of an industry being granted protection under the Safeguarding of Industries Act, any duty imposed should be effective from the date of application.

Trade Announcements.—MESSRS. VICKERS, LTD., have now acquired the whole interest in the Vickers-Spearing Boiler Co. Mr. A. H. Spearing has resigned his position as managing director, and is no longer connected with the company. The company will be carried on under the name of Vickers-Spearing Boiler Co., Ltd., as before. This change also gives Messrs. Vickers, Ltd., the control of Messrs. Tinkers, Ltd., Daisyfield Boiler Works, Hyde, near Manchester.

The name of the business of "S. E. HUNT," 272, Brighton Road, South Croydon, has been changed to Kingsdown Electrical Company. The proprietor, Mr. F. Pritchard, A.M.I.E.E., was, until January last, when he took over the business, proprietor of the Rugby Electrical Engineering Co.

Mr. E. S. MACKRILL, late of the firm of E. T. Mackrill and Sons, electrical and general engineers, of 16, Kingsbury Square, Aylesbury, has purchased the stock-in-trade, together with the whole of the machinery and plant of the firm, and will continue to trade as an electrical engineer and contractor.

Messrs. PHILIPS LAMPS, LTD., have opened a branch at 4, Park Place, Leeds, with Mr. E. H. Armitage as manager. Telephone: "Leeds 28,339."

Catalogues and Lists.—THE RELAY AUTOMATIC TELEPHONE CO., LTD., Marconi House, Strand, W.C.2.—An illustrated brochure outlining the "Relay" system of automatic telephony, and giving examples of large buildings in which private exchanges have been installed.

BRITISH CENTRAL ELECTRICAL CO., LTD., 6 and 8, Rosebery Avenue, E.C.1.—Illustrated and price pamphlets dealing with "Koh-i-Noor" adhesive tape, various patterns of ventilating fans, a shock-proof hand-lamp, a three-pin handshield plug, and a violet-ray outfit.

SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38 and 39, Upper Thames Street, E.C.4.—Catalogue Z103, containing details and prices of house service switch- and fuse-gear, watertight switches and fuses, and knife switches.

BRITISH INSULATED & HELSBY CABLES, LTD., Prescot, Lancs.—Catalogue P191, illustrating and describing "Prescot" lead joint boxes.

MESSRS. J. A. CRABTREE & CO., LTD., Lincoln Works, Walsall.—A pamphlet, illustrated in colour, advertising "Crabtree" quick-make-and-break tumbler switches.

THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2.—A fully detailed and priced pamphlet dealing with a number of "B.T.-H." radio valves.

MESSRS. NEGRETTI & ZAMBRA, 38, Holborn Viaduct, E.C.1.—An illustrated and priced catalogue of thermometers, tachometers, pressure gauges, hygrometers, and other instruments for industrial use.

THE LONDON ELECTRIC WIRE CO. & SMITHS, LTD., 7, Playhouse Yard, Golden Lane, E.C.1.—A net trade price list of wires for radio work—aerials, telephone cords, enamelled, &c.

MR. ALAN WRIGHT, Sentinel House, Southampton Row, W.C.1.—Two illustrated and priced folders, dealing respectively with the "Inventum" electric hot-water tap and the "Inventum" electric cistern.

SHELL-MEX, LTD., Shell Corner, Kingsway, W.C.2.—A handbook dealing with fuel and lubricating oils for heavy-oil engines.

THE BRUSH ELECTRICAL ENGINEERING CO., LTD., Falcon Works, Loughborough.—Publication No. 1,005, containing details of a trial of a 5,000-kW Brush-Ljungström turbo-generator installed at Wallasey.

MESSRS. CECIL HODGES & CO., LTD., Empire Works, Dalston, E.8.—An illustrated and priced catalogue of windmills for generating electricity, &c. (Verecke patents).

THE ELECTRICAL EQUIPMENT & CARBON CO., LTD., Bank Buildings, 109-111, New Oxford Street, W.C.1.—An illustrated pamphlet advertising the "Sonora" loud speaker for which the company holds the sole agency for this country.

Bankruptcy Proceedings.—F. W. CASELEY, 5, Hepworth Arcade, Hull (trading as the Radiograph Company), radio engineer.—The public examination of this debtor was held recently at the Guildhall, Hull. Debtor attributed his failure to the illness of his wife, loss on the sale of bad quality radio goods supplied by a creditor, and bad trade. He stated that instead of returning the bad quality goods that were supplied to him, he kept them in stock. The examination was closed.

H. A. SANDERS, Black Cat Restaurant, Chawston, Beds., electrical contractor, &c.—The public examination of this debtor was held on July 21st at the Shire Hall, Bedford. According to the statement of affairs, there were liabilities amounting to £2,326, and assets of £361, leaving a deficiency of £1,965. Debtor attributed his failure to the failure of certain businesses and limited companies in which he had been interested. He stated that he joined another person at Burnham-on-Sea to carry on business as electrical engineers. He first put £360 into the concern. After two years the business was formed into a limited company with a nominal capital of £5,000. The debtor was allotted 500 £1 shares and was appointed managing director at £5 per week. On the formation of this company and for its business purposes he obtained an overdraft from his bankers up to about £1,000, which was guaranteed by the present petitioning creditor. About 18 months ago the company was wound up. The debtor was a creditor of the company, and it was expected that about £10 would come to his estate. When he went to Chawston he had about £40 in cash. The object of acquiring the land was to start a petro-filling station, an electrical business, and a restaurant. The examination was adjourned. Mr. H. Ball, Duke Street, Bedford, was appointed trustee on July 17th.

J. HUMPHRIES, the yard behind the Plough Inn, Oldham Road, Rochdale, plumber and electrical engineer.—The public examination of this debtor was held on July 24th at the County Police Court, Rochdale. According to the statement of affairs, there were liabilities of £597 and assets of £276, leaving a deficiency of £321. Debtor attributed his failure to lack of capital, trade depression, and lack of commercial knowledge. He stated that he started on his own account as a plumber and electrical engineer in 1922 with £20 capital, which represented the proceeds of the sale of his furniture to his wife. At the end of 1922 he was joined by a partner with £30 capital, but in 1924 this partnership was dissolved, and debtor took over all the liabilities and assets, although he was aware of the financial position of the business. In February of this year he paid a deposit of £55 on the purchase of a house and shop for £550, but was unable to complete the purchase, and had to forfeit the deposit. The examination was closed.

G. W. TEMPEST (Northern Radio Co. and General Wireless Trading Co.), radio and telephone engineer, 40, Brazennose Street, and Arcade Chambers, Manchester, and Commercial Street, Leeds.—First meeting, August 5th, at the Official Receiver's office, Byrom Street, Manchester; public examination, September 18th, at the Court House, Manchester.

A. T. K. MOIR, trading as Moir & Watts, Weardale Road, Lee, Kent, electrical and mechanical engineer.—The public examination of this debtor was held on July 21st at the Court House, Greenwich. Debtor attributed his failure to recent inability, through illness, to exercise proper supervision over the business, lack of capital, depreciation of stock, and keen competition. He stated that his stock depreciated in 1924, and his trading loss was about £1,200. The examination was adjourned.

W. K. M. WILSON, 1, Mount Street, Heanor, Derbyshire, electrician and radio apparatus dealer.—The first meeting of creditors was held on July 23rd at the Official Receiver's offices, Nottingham. The statement of affairs showed ranking liabilities of £373 and there was a deficiency of £355. Debtor attributed his failure to the slump in trade, keen competition, and inferior goods supplied by a creditor, which had damaged his reputation. The matter was left with the Official Receiver as trustee of the estate.

M. D. ROSENBLOOM, trading as D. Rose & Co., dealer in electric lamps, 25, Osborn Street, E.—This debtor again attended on July 21st before Mr. Registrar Mellor, at the London Bankruptcy Court, for public examination on accounts showing liabilities of £2,293, against assets valued at £757. The examination had stood adjourned for the debtor to furnish cash and goods accounts. He was questioned in detail upon the accounts and the examination was ordered to be concluded.

H. M. MURAD (W. H. Murad & Co.), wireless manufacturer, 126, Princess Street, Manchester.—Last day for proofs for dividend, August 8th. Trustee, Mr. J. G. Grant, Official Receiver, Byrom Street, Manchester.

F. S. BOWEN (Manchester Electrical Maintenance Co. and F. Bowen & Co.), electrical engineer, 7, Brazennose Street, and 43, Thomas Street, Manchester.—Second and final dividend of 1s. 1 9/10d. in the £, payable August 10th, at 21, Spring Gardens, Manchester.

W. A. A. C. ROBINSON, electrical engineer, 10, Carnaby Street, Golden Square, W.—Receiving order made July 16th, on creditor's petition. First meeting, August 5th; public examination, September 1st, both at Carey Street, W.C.

R. A. BURNELL, electrical engineer, Harefield Park, Harefield, Uxbridge.—First meeting held on July 29th, at 20, Russell Square, W.C.1. Public examination, July 31st, at the Town Hall, Windsor.

J. E. LOCKING, dealer in cycles and wireless goods, 14, Fish Street, Kingston-upon-Hull.—Last day for proofs for dividend, August 5th. Trustee, Mr. J. E. D. Stickney, Official Receiver, 37, Scale Lane, Hull.

Company Liquidations.—CUTTING & MUIR, LTD., electrical engineers, St. Matthews Street, Ipswich.—A meeting of the creditors of the above was held recently at Ipswich. A statement of affairs was submitted, showing the position as at June 29th, prepared by the liquidator, Mr. Chas. G. Hines, accountant, of 4, Museum Street, Ipswich. This disclosed liabilities of £1,335, all of which was due to the trade. The assets totalled £875, but from this had to be deducted £42 for preferential claims, leaving net assets of £833, or a deficiency as regarded the creditors of £502. It was reported that the business was originally commenced as a partnership concern on June 1st, 1919. It was, however, subsequently sold to the limited company, which was registered in 1920, with a nominal capital of £5,000. There had been issued 3,500 shares, all of which, it was understood, were paid for in cash, with the exception of those issued in respect of the purchase consideration. Trading figures were submitted which showed that the total trading losses had been £3,372, which practically accounted for the whole of the capital of the company. It was decided to confirm the voluntary liquidation of the company, subject to Mr. Osborne being joined as co-liquidator with Mr. Hines, the shareholders' nominee. It was also resolved that the liquidators should enter into negotiations forthwith for the disposal of the business as a going concern. A committee was appointed consisting of representatives of the General Electric Co., Ltd., Callender's Cable & Construction Co., Ltd., and the Metropolitan-Vickers Electrical Co., Ltd.

The following are the principal creditors:—

	£		£
A. C. Motor Accessories	21	Callender's Cable & Construction Co., Ltd.	228
Bennett & Snare, Ltd.	36	Falk, Stadelmann & Co., Ltd.	24
British Thomson-Houston Co., Ltd.	87	General Electric Co., Ltd. ...	359
Cannon, F. W., & Sons	14	Metropolitan-Vickers Electrical Co., Ltd.	262
Chloride Electrical Storage Co., Ltd.	27	Ruston & Hornsby, Ltd.	50

HENRY JOSEPH & CO., LTD., 96, Victoria Street, London, S.W., electrical engineers.—At a recent meeting of the creditors the chair was occupied by Mr. Norman Bell, C.A., the liquidator in the voluntary liquidation. It was stated that the shareholders had previously passed the usual resolution for voluntary liquidation, and had appointed Mr. Bell, of 26-27, Bush Lane, E.C., to act as liquidator. A statement of affairs was submitted, disclosing liabilities of £4,091, and total assets of £3,196, from which had to be deducted £87 for preferential claims and £2,947 in respect of debentures and interest, leaving net assets of £1,162, or a deficiency as regarded the creditors of £2,929. Mr. Bell reported that at the date of his appointment a receiver was in possession for the debentureholders. The Receiver, Mr. R. G. Sidford, of 36, Southampton Street, Strand, W.C., was appointed under the debenture deed as from June 18th last. He (Mr. Bell) understood that the receiver had previously been the auditor of the company, and it had been the intention of the shareholders to appoint that gentleman as liquidator. The principal creditors were Messrs. W. & T. Loch, of Bath, and they were consulted. They expressed the opinion that an independent liquidator should be appointed to represent the trade, and his (the chairman's) name was put forward. He added that the company was registered on July 27th, 1923, to take over as a going concern a business which had previously been carried on under the style of Henry Joseph & Co. No resolutions were passed by the creditors, and consequently the voluntary liquidation will be continued with Mr. Bell as liquidator. The principal creditors are:—

	£		£
Loch, W. & T.	1,090	Bankers	615
Meyer, L.	709	Vesshoff, H.	312

WIRELESS VALVES, LTD., 85, Rosebery Avenue, London, E.C.1.—A meeting of creditors was called for July 27th at the offices of the company. Resolutions for voluntary liquidation had previously been passed, and Mr. G. F. Marreco, the managing director of the company, was appointed as the liquidator. No creditors attended the meeting, and it is stated that all the liabilities have been discharged. The voluntary liquidation of the company will therefore be continued with Mr. Marreco as the liquidator.

BRITISH PORTABLE RADIO, LTD.—Winding up voluntarily. Liquidator, Mr. W. E. Bundy, 31, Bedford Row, E.C. Meeting of creditors at 31, Bedford Row, August 1st.

RADIOPHONES, LTD.—Winding up voluntarily. Liquidator, Mr. H. Lever, Chiswell House, Finsbury Pavement, E.C. A meeting of creditors was called for July 24th, at the offices of the liquidator. Particulars of claims to be sent to the liquidator by July 31st.

LEAD HYDRATE & BATTERY CO., LTD.—Winding up voluntarily. Liquidator, Mr. P. B. Nevill, 94, Old Broad Street, E.C. Meeting of creditors, August 4th, at the liquidator's offices; particulars of claims to the liquidator by August 14th.

W. R. THORNTON & SON, LTD.—A meeting of creditors was called for July 27th at the Duke of Edinburgh Hotel, Abbey Road, Barrow-in-Furness. Liquidator, Mr. W. H. Hole, 105, Duke Street, Barrow-in-Furness.

RODERICK ELECTRIC SUPPLIES CO., LTD.—Winding up voluntarily. Liquidator, Mr. W. H. Cork, 19, Eastcheap, E.C.

INTERNATIONAL RADIO MANUFACTURERS, LTD.—Winding up voluntarily. Liquidator, Mr. P. B. Nevill, 94, Old Broad Street, E.C. Meeting of creditors, August 4th at the liquidator's offices.

INGLEBY & CO., LTD.—Winding up voluntarily. Liquidator, Mr. R. E. Starkie, 6, South Parade, Leeds. Meeting of creditors at the Hotel Metropole, Leeds, July 30th.

LELIOS LAMP CO., LTD.—A meeting of creditors was called for to-day at 58, Southwark Street, S.E. Liquidator, Mr. E. L. Butler. (This notice is purely formal; all creditors have been or will be paid in full.)

GAS AND ELECTRIC SECURITIES, LTD.—Winding up order made by the High Court on July 21st.

Composition Annulled.—At Bolton County Court, on July 23rd, the Official Receiver applied for the annulment of an order approving a composition submitted by W. T. Smith, electrical and mechanical engineer, Bolton, and acceded to by his creditors. The receiving order was made in January, 1918, and in November, 1919, debtor's proposal to pay a composition of 5s. in the £ was accepted. Debtor paid the first instalment but no more. The arrangement was that amounts of 1s. 8d. should be paid five months later and again ten months later. Debtor had paid £336; he was four years behind time. The debtor explained that the moneys he had received had been taken up in perfecting an invention. The judge said that creditors must come first, and annulled the composition and adjudicated debtor bankrupt; the order would not operate if in three months debtor paid an instalment.

Private Arrangements.—H. W. SUTTON, trading as C. A. Sutton & Co., wholesale electrical supplies dealer, 110, Dale Street, Liverpool.—The creditors interested herein were called together recently, at the offices of Messrs. Latimer & Kelsall, accountants, Liverpool. A statement of affairs was submitted which disclosed liabilities of £4,233, of which £3,530 was due to unsecured creditors, and there were partly secured creditors for £703. The total amount of their claim was £933, but they held security valued at £230. There were, in addition, fully secured creditors for £3,830, holding securities of the estimated value of £4,300, leaving a surplus of £470. The assets were estimated to realise £1,721, from which had to be deducted £55 for preferential claims, leaving net assets of £1,666, or a deficiency of £2,566. The fully secured creditors were the mortgagees of the debtor's house and business premises. The partly secured creditor was the bank. The debtor commenced business in 1907 and carried it on until 1916. He then joined the Forces and his father carried on during his absence. No books were kept until 1920, when a statement prepared showed the capital at £2,849. It was stated that items of loan, &c., amounting to £1,181, which had gone into a private account, were not taken into the balance sheet at March 31st last. It was decided that the estate should be dealt with in bankruptcy. The following are creditors:—

	£		£
Brown Bros., Ltd.	664	Richardsons	280
Wightman, J. H.	620	General Electric Co., Ltd. ...	100
Wolff, S. & B.	283	Gilbert, J., & Co.	95
Bold, W., & Co., Ltd.	157		

Dissolutions of Partnership.—STEPHENS BROS., electrical and wireless engineers, 83, Stretford Road, Hulme, Manchester.—Mr. P. C. Stephens and Mr. W. Stephens have dissolved partnership. Debts will be attended to by Mr. P. C. Stephens, who will continue the business.

K. & W. RADIO SERVICE, retail wireless salesmen, 69, High Street, Thornton Heath.—Mr. R. S. Keeler and Mr. J. E. Wood have dissolved partnership. Mr. Wood will attend to debts and contiaue the business under the same style.

E. T. MACKRILL & SONS, electrical and general engineers, 16, Kingsbury Square, Aylesbury.—Mr. E. S. Mackrill and Mr. W. H. Mackrill have dissolved partnership.

Fire.—A fire occurred at the premises of the Kingsbury Wireless Engineering Co., Kingsbury, Hendon, on July 21st, causing considerable damage to a stock of accumulators and radio apparatus.

Deed of Assignment.—A. WALKER and C. WALKER (Walker Wireless Supply Co. and Newcastle Wireless Supplies), radio engineers and vendors of wireless goods, 31, Westgate Road, Newcastle-on-Tyne, 104, Leith Street, Edinburgh, 34, Broad Street, Aberdeen, and 58, Wellgate, Dundee.—Particulars of claims by August 4th to Mr. H. J. Armstrong, Trustee, Emerson Chambers, Blackett Street, Newcastle-on-Tyne.

Receiver Appointed.—WRIGHT MOTORS, LTD. Century Works, Halifax.—Mr. S. Laycock has been appointed receiver by the debenture-holders.

British Trade Mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed trade marks may be lodged within one month from July 22nd :—

Abel (lettering and design). No. 457,223. Class 8. Instruments and apparatus for use in radio-telegraphy and telephony.—Austin Brothers Electrical Co., Ltd., Manbey Road, Stratford, E.15.

Rheco. No. 458,922. Class 8. Electrical, radio, telephonic, and telegraphic apparatus.—Robinson & Hands Electrical Co., Ltd., 54, Barwick Street, Birmingham.

Adico high-tension battery, noiseless, accurate (lettering and design). No. 459,057. Class 8. High-pressure batteries.—Adic & Co., Ltd., 2, Aldermanbury, E.C.2.

Adaptolite. No. 459,734. Class 8. Radio-telegraphic and telephonic apparatus.—Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz, 12, Place des Etats Unis, Montrouge, Seine, France. (British representatives: Mewburn, Ellis & Co., 70-72, Chancery Lane, W.C.2.)

Zenal. No. 452,182. Class 13. Electric fuses and cut-outs of ordinary metal.—Parmiter, Hope & Sugden, Ltd.

Glasgonex. No. 459,531. Class 13. Electric switches (ordinary), electric fuses and cut-outs.—The Midland Electric Manufacturing Co., Ltd.

Electric Power Supply in Brazil.—The July *Monthly Review* of the Bank of London and South America, Ltd., states that the governor of the state of the Rio de Janeiro has recently signed a contract with the Rio de Janeiro Tramway, Light and Power Company, by which the company undertakes to supply electricity to the towns of Campos, Macahé, and Sao Joao da Barra. The terms stipulate that the company shall pay to the State the sum of 15,000 contos over a period of ten years. It is believed that the supply of electric power to those towns, which are exclusively agricultural and produce mostly sugar, will be an important factor in transforming them into large industrial centres.

A Brazilian Telephone Concession.—It is reported that the municipal authority of Sao Paulo has approved a new contract with the Brazilian Telephone Co. The ratification of the agreement is in doubt as there is considerable opposition to the granting of a 40-year concession and to the rates which the agreement sanctions.

Electrical Construction in Brazil.—The President of the State of Sao Paulo has issued a decree calling for further and more widely-diffused electrical services in that State. New works, to supplement those already in existence and to provide power for a number of new industrial purposes, will hereafter be placed under the direction of the State Ministry of Agriculture, Commerce and Public Works.—*Reuter's Trade Service* (Sao Paulo).

Unemployment.—A PROPOSAL.—We have received a copy of a pamphlet written by Mr. E. A. Radford, F.C.A., M.P., setting forth details of the suggested remedy for unemployment which he outlined in the debate which took place in the House of Commons on June 29th. He holds that the reason for our unemployment is that British goods are costing more than those of other industrial nations, and therefore are unable to compete with them either abroad or in the home market. By all classes of the population uniting in a common sacrifice, costs must be brought down. The Government is looked to by the author as being able to ascertain the percentage of reduction necessary in the trades that suffer most from competition. If it be found to be 10 per cent., he would have an Act passed, "The National Emergency Ten Per Centum Deduction Act," which would be used to reduce by 10 per cent. during the period of national emergency until trade was re-established, all rents, royalties, ground rents, professional charges, bank interest and charges, interest on investments, salaries, insurances, postages, &c., and make an effective saving of a similar percentage in all wages. It is a big order and a remarkable conception—nearly everybody would sacrifice a considerable part of his or her income in order to be able to buy and sell more goods. A 10 per cent. reduction would be made from the wages of the "higher-paid" workers, but in the case of the "lower-paid" workers they would suffer no drop, but would give 10 per cent. more work for the same money. The Government would pay 10 per cent. less than at present in interest, there would follow a big fall in taxation, and so forth and so on. And then when everybody had agreed to make his 10 per cent. common sacrifice, the cost of living would fall and that of British goods would go down by approximately 10 per cent. Competitive sales would revive (if something did not happen to reduce foreign costs further), and the burden of unemployment pay would be lessened as trade became re-established. Unfortunately, many difficulties are anticipated in the working out of the scheme, and these we are not sure that it is worth while discussing at the present moment, for the greatest need of all preliminary to anything and everything else is that there should be real evidence of the willingness of all classes to bear their rightful share in the common sacrifice as worked out in percentages either of possession or of leisure. What endless controversy and bloodshed would gather about the settlement of what was that rightful share!

The registers of the Unemployment Exchanges showed a total of 1,248,500 wholly-unemployed persons on July 13th. This was a decrease of 51,850 on the week, but the figure was still 222,500 in excess of that of a year ago.

Engineering Employés' Wages.—A further conference took place on July 23rd between representatives of the Engineering and Allied Employers' Federation and the engineering trade unions. It was agreed to approach the Government with a view to steps being taken to secure an arrangement whereby the working hours of competitor nations on the Continent should be put on a similar basis to working hours in Great Britain.

Book Notices.—"Science Abstracts" A and B. Vol. XXVIII. Part 7. July 25th, 1925. London: E. & F. N. Spon, Ltd. Price 3s. each.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLIV, No. 7. July, 1925. New York: The Institute. Price $1.

The *Transactions* of the South African Institute of Electrical Engineers. Vol. XVI. Part 4. May, 1925. Price 2s.

"Dynamo Electric Machinery," by E. Hausmann. Pp. viii+645; figs. 447. London: Crosby, Lockwood & Son. Price 21s. net.

"The Dynamo," by C. C. Hawkins. Vol. III, "Alternators." Pp. xviii+572; 710 figs. London: Sir Isaac Pitman and Sons. Price 30s. net.

Annual Holidays.—The works of Messrs. Vickers-Petters, Ltd., Ipswich, will be closed from to-night (Friday), until the morning of Monday, August 10th.

The works of the Jackson Electric Stove Co., Ltd., will be closed from August 1st to 9th for the annual holiday.

The works of the Electro-Generator Co. at Hammersmith will be closed from August 1st until August 10th for the holidays.

Messrs. E. Brook, Ltd., of Huddersfield, announce that their works and offices will be closed from Friday, September 4th, until Monday, September 14th, for the annual holidays.

The works of the London Electric Firm will be closed from to-night (Friday) and will re-open on Monday, August 10th. A small staff will be in attendance to deal with urgent business.

Income Tax.—The *Financial Times* has issued the 1925 edition of its "Income Tax Guide" (one shilling net). It has been revised by G. H. Bridge, A.S.A.A., A.C.I.S. It is based on official data and shows the amount payable, how to obtain relief, giving tables and examples, as well as chapters on Corporation Profits Tax and the new Pensions Bill.

Certificate for a Storage Geyser.—The "Bastian" electric storage geyser has been tested and approved by the Good Housekeeping Institute, and Messrs. Bastian & Allen have received a certificate for it. The firm state that theirs is the only electric geyser that has been approved by the Institute.

The German Radio Exhibition.—From Berlin we learn that over 150 firms have already secured space at the second annual radio exhibition which is to be held in that city from September 4th to 13th next.

For Sale.—Offers are invited for the whole of the plant at H.M. power station, Beachley, near Chepstow, which includes coal-handling plant, four Babcock & Wilcox boilers, economisers, one 1,000-kW set, and two 3,000-kW sets, together with switchgear and auxiliaries. Southern Railway Stores Department has for disposal surplus electrical machinery and boiler-house plant at Southampton Docks. Darlington Corporation Tramways Department invites offers for 16 single-deck, six open-top double-deck, and two covered-top double-deck tramcars. Manchester Electricity Department has for disposal three A.E.G. 150-kW motor-generators. (See our advertisement pages to-day.)

Encouraging Electric Water Heating.—We are informed by the borough electrical engineer of Woolwich (Mr. G. W. Keats) that his department has instituted a special rate for electricity for continuous electric water heating. For a 20- or 30-gal. hot-water cylinder having an immersion heater permanently in circuit a charge of ½d. per kWh is made.

Opportune Advertising.—The new high-power station of the British Broadcasting Company was opened on Monday last and advantage was taken of the occasion by the British Thomson-Houston Co., Ltd., to distribute large coloured posters of a topical nature. One of these bore a map indicating the range of the Daventry station, and the appropriate "B.T.-H." receiving sets for varying distances and requirements. The other poster advertised the best valves to use for the reception of the Daventry transmissions.

An Australian Siemens Company.—The *Financial Times*, after referring to the registration in the Commonwealth of Siemens (Australia) Proprietary, with a capital of £100, in shares of £1 each, to conduct the business of manufacturers of electric wires and cables and other electrical goods, &c., states that Mr. H. P. Slipper, general manager in Australia for Siemens Bros. & Co., and electrical trade counsellor on the executive council of the Australian Association of British Manufacturers and their Representatives, is visiting this country. Mr. Slipper, while in Great Britain, will represent the executive council in matters requiring attention in London.

Lead. — Reporting on July 25th, Messrs. James Forster and Co. stated:—"The general position is unchanged. Consumption continues on a large scale, but arrivals have been up to the average this month, though 'spot' lead is not too plentiful. . . . The present price seems high enough for the moment, particularly in view of the threatening industrial situation, but, given a satisfactory settlement, consumption will go ahead and it will then remain to be seen whether supplies will be sufficient to meet the demand."

New German Companies. — Among the new companies recently formed in Germany in connection with the electrical industry are the Schuckert Betriebe Gesellschaft, Munich, capital £150,000; the Obere-Saale Gesellschaft, Weimar, capital £50,000, to establish hydro-electric plants in Thuringia; and the Nordharzei Kraftwerke Gesellschaft, Goslar, capital £20,000.

Chinese Notes.—A local capitalist of Shihpeichen, a market town about 100 li (33 miles) from Anking (Anhwei province) is negotiating for the purchase of one of the Anking Electric Light Company's plants from which he intends to distribute electricity in the Shihpeichen district.

The trackwork of the Mukden city tramway system has been completed, and a commencement has been made with the overhead equipment.

The Radio Corporation of America.—The *Financial Times* says that in curious contrast to the experience of the British Marconi Company, not to mention the British Broadcasting enterprise, the Radio Corporation of America appears to be encountering rather difficult times. For the past quarter it reports the first deficit in its history, a net loss of nearly $400,000 for that period comparing with a net profit of almost $2,000,000, for the previous three months. Its gross income, it seems, showed a very serious shrinkage, being only about $4,500,000 for the June quarter, in contrast with $15,000,000 for the three months to the end of March. While seasonal conditions are regarded as partly responsible for the unfavourable results now disclosed, it is admitted that the chief cause of the decline in earnings is the price-cutting of rival undertakings. The corporation for the present has refused to lower its prices, but another experience such as that of the past quarter may force it to alter its decision. For the last year a net profit of over $9,500,000 was reported. All but $1,384,000 of that sum was required for the payment of the preferred dividend and $3,356,000 credited to surplus account was absorbed by taxation, depreciation and the writing down of various items.

Rumanian Orders for Cables.—*Reuter's Trade Service* (Berlin) says that, according to the *Taegliche Rundschau*, several British and German firms tendered for the supply of cables and telephone apparatus of the value of 30,000,000 lei to the Postal, Telegraph, and Telephone Department at Bukarest. One British and three German firms were successful. The *Financial Times* states that the successful British firm is W. T. Henley's Telegraph Works Co., Ltd.

Copper, Lead, and Rubber Prices.—Messrs. F. Smith and Co. report, July 28th: Copper (electrolytic) bars, £67, 5s. dec.; ditto, ditto sheets, no change; ditto, ditto wire rods, £77, 5s. dec.; ditto, ditto h.c. wire, 9¼d., 1/16d. dec.

Messrs. James & Shakespeare report, July 28th: No change in the price of copper bars (best selected), sheet and rod; English pig lead, £36 15s., 10s. inc.

Messrs. E. Till & Co. report, July 28th: India rubber, Para, fine, 4s. 5d., 4d. inc.

Lighting and Power Notes.

Bath.—YEAR'S WORKING.—The statement of accounts of the electricity undertaking (engineer: Mr. F. Teague) for the year ended March 31st last, shows an income of £55,430, against £53,181 for the previous year. The working expenses are recorded as £31,165, against £25,779, leaving a gross profit of £24,265 (£27,402). A net surplus of £6,319 is shown after deducting the capital charges, &c., compared with £12,188 for the year 1923-4. The capital expenditure for the year amounted to £60,180, bringing the total up to £369,462. The principal items of capital expenditure were £16,756 for mains, £14,872 for machinery and plant, and £11,479 for turbo-generators. The total sales of energy for the year amounted to 4,390,951 kWh, an increase of 840,295 kWh above the preceding year. The maximum demand for the year was 3,380 kW.

Bexhill.—MAINS EXTENSIONS.—The Electricity Committee has decided to extend mains to Whydown Place, at a cost of £412, and to Limsford Cross at a cost of £1,326, when there is sufficient revenue to justify the expense.

Birmingham.—RATE RELIEF.—The Finance Committee has recommended that the Electricity, Gas and Tramway Departments should each contribute 1 per cent. of the capital value of the undertaking to the relief of the rates. This would be equivalent to £102,000 per annum.

Blackpool.—YEAR'S WORKING.—The financial statement of the electricity undertaking (engineer, Mr. C. Furness) for the year ended March 31st, 1925, shows an income of £155,327 and a working expenditure of £94,610, leaving a gross profit of £60,717. The corresponding figures for the previous year were £141,586, £88,459, and £53,127. A net surplus of £29,884 is left after deducting the capital charges, &c., against £26,567 for the year 1923-24. The capital expenses during the year amounted to £8,507, making a total of £596,070. The average price per kWh during the year was 3.08d.

AUTHORITY TO INSTALL NEW PLANT.—The Mid-Lancashire Electricity Board has given the Corporation authority to install a 2,000-kW set at a cost of £12,000.

Bournemouth.—HOSPITAL INSTALLATION.—The Corporation has decided to install electricity at the Sanitary Hospital at a cost of £2,300.

Bradford.—APPLICATION FOR LOAN.—The Electricity Committee is applying for sanction to borrow £10,310 in connection with the renewal of e.h.p. feeders to Apperley Bridge.

Calne.—APPLICATION FOR LOAN.—The Town Council has decided to apply for a loan of £6,347, the estimated cost of obtaining and distributing electricity within its compulsory area.

Canada.—ONTARIO HYDRO-ELECTRIC REPORT.—The seventeenth annual report of the Ontario Hydro-Electric Power Commission shows that after reducing rates in many rural districts and paying all operating expenses, the year's working yields a net profit of 725,000 dollars. In spite of some industrial depression, the Commission experienced an increased demand for power on almost all its systems, some of which are reaching the capacity of their existing generating stations. The receipts for power sold during the year totalled $16,897,000.

Cheadle and Gatley.—NEW CHARGES.—The Council is to abolish the present system of charging and establish a flat rate of 6d. per kWh.

Chester.—ELECTRICITY SUPPLY.—The Electricity Committee has decided to approve the terms for a supply of electricity to Hawarden Rural District Council be affirmed, and the town clerk is to be instructed to apply to the Electricity Commission to revoke the Fringe Orders authorising a supply of electricity to Mancott Royal Estate.

Chesterfield.—YEAR'S WORKING.—We have received from Mr. D. H. Davies, borough electrical engineer, a statement of accounts for the electricity undertaking for the year ended March 31st last. The total revenue amounted to £46,443, against £41,574 for the preceding year. The working costs are shown as £22,386, against £20,124, leaving a gross profit of £23,721 (£21,053). The deduction of capital charges leaves a net profit of £5,471, compared with £4,984 for the previous year; £14,994 was spent upon the capital account during the year, making a total capital expenditure of £218,667. The sales of energy increased from 5,601,315 kWh to 6,445,550 kWh, and the average price per kWh was reduced from 1.69d. to 1.64d. during the year. The maximum demand for the year was 3,567 kW.

Chichester.—PURCHASE OF SUB-STATION.—The Corporation has arranged for the purchase of a sub-station in connection with the supply of electricity to Selsey.

Continental.—SWITZERLAND.—Work is now actively in hand on the construction of the new Ober Hasli power station in the Grimsel district. To supply the necessary electrical energy for the construction work a special cable is being laid between the Central Swiss Power Co.'s station at Eiswil and Innertkirchen *via* Lungern, the Bruning Pass and Meiringen. A light railway for the transport of material is also being built between Meiringen and Innertkirchen, a distance of about three miles.

A proposal is under consideration by the Swiss Government to raise the level of Lake Taillieres in the Locle district of the Canton of Neuenburg with the object of securing increased power for electrical purposes.

ITALY.—La Società Lombarda per Distribuzione d'Energie Elettrica, has recently been authorised to erect a 135,000 V transmission line between Piattamala, near Tirano and Valsassina, across the province of Sondrio and Como.

NORWAY.—*Transformers for Bergen and Nore.*—The Norwegian A.S. Per Kures Fabrikker, of Vestre Aker, is reported to be delivering two transformers, each of 15,000 kW, for the Dale installation at Bergen, and transformers of 30,000 kW, 143,000 V, for the State works at the Nore.

Croydon.—NEW CHARGES.—The Electricity Committee has recommended the following charges:—Up to and including 1 h.p.: First 200 kWh per annum, 5d. per kWh. Over 1 h.p. and up to and including 2 h.p.: First 400 kWh per annum, 5d. per kWh. Over 2 h.p.: First 600 kWh per annum, 5d. per kWh; beyond, 1d. per kWh. Power consumers whose consumption is under 2,400 kWh per annum, if they guarantee this minimum consumption, will have the option of being charged under the time-switch system.

MAINS EXTENSIONS.—The Electricity Committee has decided on mains extensions at a cost of £2,450.

Dewsbury.—STORM DAMAGE.—During a violent thunderstorm on July 22nd, some of the overhead equipment of the Yorkshire Electric Power Co. was put out of action.

Dodworth.—BULK SUPPLY.—The Urban District Council has decided to support an application by the Electrical Distribution of Yorkshire, Ltd., to supply electricity in bulk to the district.

Durham.—SUPPLY OFFER.—The Rural District Council has decided to make further inquiries in connection with an offer from the Weardale Steel, Coal & Coke Co. to supply electricity to the Ludworth houses at 6½d. per kWh, provided the Council undertakes to collect money due from the tenants.

Faversham.—PRICE REDUCTION.—The Town Council has reduced the charge for electricity for lighting from 10d. to 9½d. per kWh.

Grimsby.—YEAR'S WORKING.—The twenty-fourth annual report and statement of accounts for the year 1924-5 of the electricity undertaking (engineer, Lt.-Col. W. A. Vignoles) records an income of £78,150, against £78,410 for the preceding year. The working costs are shown as £46,493, against £46,432, leaving a gross surplus of £31,072, after deducting bad debts. A net profit of £5,558 is shown after deducting the capital charges, &c., against £8,035 for the year 1923-4. The sales of energy increased by over a million kWh, the average price per kWh being 1.83d., and the maximum demand on the station was 4,396 kW. The capital expenditure during the year amounted to £54,326, including £32,091 on machinery and £12,428 on mains, bringing the total capital expenditure up to £415,460.

Hartshorne and Seale.—ELECTRICITY CHARGES.—The Rural Council has received from the Burton-on-Trent Town Council an undertaking that the charges for electricity in the district shall not exceed 1d. for lighting and 15 per cent. for power above the charges in operation in the borough.

Huddersfield.—APPLICATION FOR GRANT.—The Electricity Committee has decided to apply to the Unemployment Grants Committee for a grant towards the cost of the proposed extension of mains to Crosland Hall during the coming winter.

Irish Free State.—LIMERICK.—The Lighting Committee has decided to adjourn the consideration of extensions to the electricity works, pending an interview with the Minister of Industry and Commerce, relative to the probable bearing of the Shannon Power Scheme on the city's electricity supply.

Kingussie.—TEMPORARY SUPPLY.—The Town Council is asking Messrs. Balfour, Beatty & Co. if they would object to the installation of a temporary power scheme on the understanding that the supply would be taken from the company as soon as it is in a position to give it.

Liverpool.—NEW STATION.—Rapid progress is being made with the extension of the Lister Drive power station, which is to house initially two, and eventually five, 25,000-kW turbo-alternators.

London.—ST. MARYLEBONE.—The Electricity Committee has recommended special flat rates of 1d. per kWh for inside shop-window lighting after closing hours, and ½d. per kWh for water heating in blocks of flats, &c. The Council has approved of the expenditure of £20,000 for mains extensions, &c., for the two years ending March 31st, 1927.

BERMONDSEY.—The Electricity Committee is to seek sanction for a loan of £8,000 for mains, services, and meters. It is also to lay a main in Beatrice Road at a cost of £1,651.

BATTERSEA.—The Electricity Committee has decided to replace the distributors at Lavender Hill and lay conduits for future cables at a cost of £4,483. The Council proposes to adopt a scheme to improve the lighting at the town hall buildings at a cost of £1,100. The borough engineer has prepared plans for offices and showrooms for the Electricity Department at Lavender Hill.

SHOREDITCH.—The Electricity Committee has prepared a scheme for extensions to the plant at the electricity works at a cost of £70,000, including the provision of a 10,000-kW turbo-generator.

POPLAR.—The mills of Messrs. McDougall, of the Wheatsheaf Mills, Millwall Docks, are to be converted from steam and gas to electric drive. The supply, estimated at one million kWh per annum, will be taken from the Corporation undertaking.

The Electricity Committee has obtained sanction to borrow £1,413 for a low-pressure feeder from High Street sub-station to Robinhead Lane.

Middlesbrough.—APPLICATION FOR LOAN.—The Corporation is applying for sanction to borrow £3,058 for the purpose of an electricity sub-station.

Northampton. — MAINS EXTENSIONS. — The Northampton Light & Power Co., Ltd., is to extend its mains from Mill Lane to Kingswell Road.

Peterborough.—CATHEDRAL INSTALLATION.—Electric lighting is being installed in the Cathedral at a cost of £2,000.

WORKS EXTENSIONS.—The Corporation proposes extensions to its generating station, including a new 6,000-kW turbo-alternator.

Plymouth.—LOAN FOR EXTENSIONS.—The Electricity Committee is to borrow £1,000 for the provision of two transformer chambers at North Prospect.

CABLE EXTENSIONS.—The Electricity Committee has authorised various cable extensions at a cost of £2,500.

REPORT ON RIVER AVON.—The Corporation has decided to invite a firm of hydraulic engineers to report as to the sufficiency of the flow of the River Avon for the purposes of a turbine, and also as to the cost of installing the necessary plant.

Preston.—NEW PLANT.—The Finance Committee has authorised the Electricity Committee to proceed with the installation of a third turbo-generator set at Ribble power station, at an estimated cost of £90,000.

Rawtenstall.—APPLICATION FOR LOAN.—The Town Council has decided to apply for sanction to borrow £32,000 for the purpose of extending the plant at the electricity works, Hareholme.

Saffron Walden.—LOAN SANCTIONED.—The Town Council has received sanction to borrow £880 in respect of new battery plant.

Shoeburyness.—SUGGESTED SUPPLY FROM WAR DEPARTMENT.—The Urban Council has decided to ascertain if the War Department can supply electricity for lighting and power, and if so upon what terms and at what cost.

Southend-on-Sea.—NEW DIESEL.—Following the advice of Col. Ekin at the recent inquiry of the urgent necessity of making an earlier application for sanction to install a spare Diesel engine, the Town Council has empowered the Electricity Committee to accept the lowest or most suitable tender of those of six firms for re-conditioning an engine and fitting it with a dynamo at a cost of not more than £10,000.

Sowerby Bridge.—APPLICATION APPROVED.—The Urban District Council has given its consent to the application of the Electrical Distribution of Yorkshire, Ltd., to the Electricity Commissioners for a Special Order to supply electricity for public and private purposes within the urban district.

Stoke.—EXTENSION OF STATION.—As the result of a recommendation made at a conference of authorised undertakers of the North-West Midlands District that each turbine station in that area should be extended to its ultimate economical capacity in order to meet the views of the Electricity Commissioners, the Council has decided to request Mr. Arthur Ellis, consulting engineer, to report upon the ultimate economical capacity of the power house site.

TEMPORARY SUPPLY.—The Electricity Committee, at the request of Mr. W. M. Selvey, consulting engineer of the Stone U.D.C., has agreed to supply under a fringe order until the Stone U.D.C. is able to obtain a special order.

DISTRIBUTION.—The Electricity Committee has decided to erect a sub-station off Shirley Road, and to lay mains at a cost of £1,000 to supply the district below Hanley Park.

HOUSING SUPPLY.—The Housing Committee recommends a supply of electricity to all the Council houses, at a cost of £5,000.

Special Orders. — The Electricity Commissioners have submitted to the Minister of Transport for confirmation, Special Orders made by them for the supply of electricity in the following districts. Parts of the parishes of Llechwedd, Llangelignin and Llangwstenin, in the Rural District of Conway, Carnarvon, by the Borough of Conway; part of the County Borough of Barnsley, by the County Borough of Barnsley; in the Urban District and Rural District of Woodbridge, and the Parish of Melton, by the Woodbridge and District Electric Light Co., Ltd.

The Urban District Council of Dartford is applying for a Special Order to extend its area of supply.

The Wallingford & District Electric Supply Co., Ltd., is applying for a Special Order to supply electricity in the Borough of Wallingford, and the outlying districts.

Trowbridge.—LIGHTING COMPLAINTS.—The Urban District Council is to communicate with the Trowbridge Electric Supply Co. concerning complaints received as to the lighting of the Ashton and Harford Streets.

Warrington.—EXTENSION OF SUPPLY.—The Corporation has decided to lay the necessary cables, and to build a sub-station for a supply of electricity to the Thelwall area.

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Electricity Supply in Preston.

Inauguration of the Ribble Capital Station.

IT was in 1891 that the National Electric Supply Co. obtained a Provisional Order authorising it to supply electricity within the county borough of Preston, the company commencing on a small scale with a temporary power station pending the completion of the permanent station in August, 1892. For some years operations were confined to a portion of the central area, until an extension order was obtained in 1898. The Crown Street station not being adequate to meet the post-war demand, the company acquired a site in Penwortham, on the south bank of the Ribble. In view, however, of the fact that the undertaking was purchasable by the Corporation in 1932, negotiations which had taken place some years earlier with the Corporation were re-opened, with the result that the Corporation obtained a special order in 1922 authorising the purchase of the company's powers.

Fig. 1.—The Ribble Capital Station.

Mr. J. A. Robertson, M.I.E.E., M.I.Mech.E., who had been advising the company, was retained as consulting engineer, and the Electricity Commissioners' sanction for the new station was obtained in May, 1922, the contracts for the main plant and buildings being placed by the following September. Since construction was commenced, the Mid-Lancashire Electricity Advisory Board has been constituted so that the new station will undoubtedly play an important part in the development of the Mid-Lancashire Electricity District, which extends from Fleetwood on the north-west, to Colne and Nelson on the east, and Chorley on the south.

The Corporation has entered into an agreement with the Lancashire Electric Power Co. to furnish a bulk supply for distribution by the company in the Leyland and Walton-le-Dale districts; the mains are partly laid and a supply is expected to be available in October next, while a further development is the inter-connection of the Blackburn (Whitebirk) and Ribble stations. This line forms an important link in the technical scheme for Mid-Lancashire, and the contracts for a 33,000-volt main capable of passing 10,000 kW, with the necessary transformers and switchgear, have been placed in order that the line may be in operation before the end of the year. Negotiations have also been taking place between Preston Corporation and the coast towns, comprising Blackpool, Lytham, St. Annes, and Fleetwood for a supply of 5,000 kW (rising to 10,000 kW), and the increased demand which will be made during the forthcoming year will involve an extension of the new plant described below, which was inaugurated by Sir John Snell, chairman of the Electricity Commission, on July 22nd.

The new station, fig. 1, is situated approximately 1½ miles from the centre of the town. The site extends to about 33 acres, and the river is tidal, with a maximum variation of 22 ft., having a minimum flow during dry weather of approximately five million gallons per hour. This amount of water is considered sufficient for the first section of the station, but it is proposed to impound tidal water for the second section by constructing a weir across the river, when it is estimated that the water available will be sufficient for condensing pur-

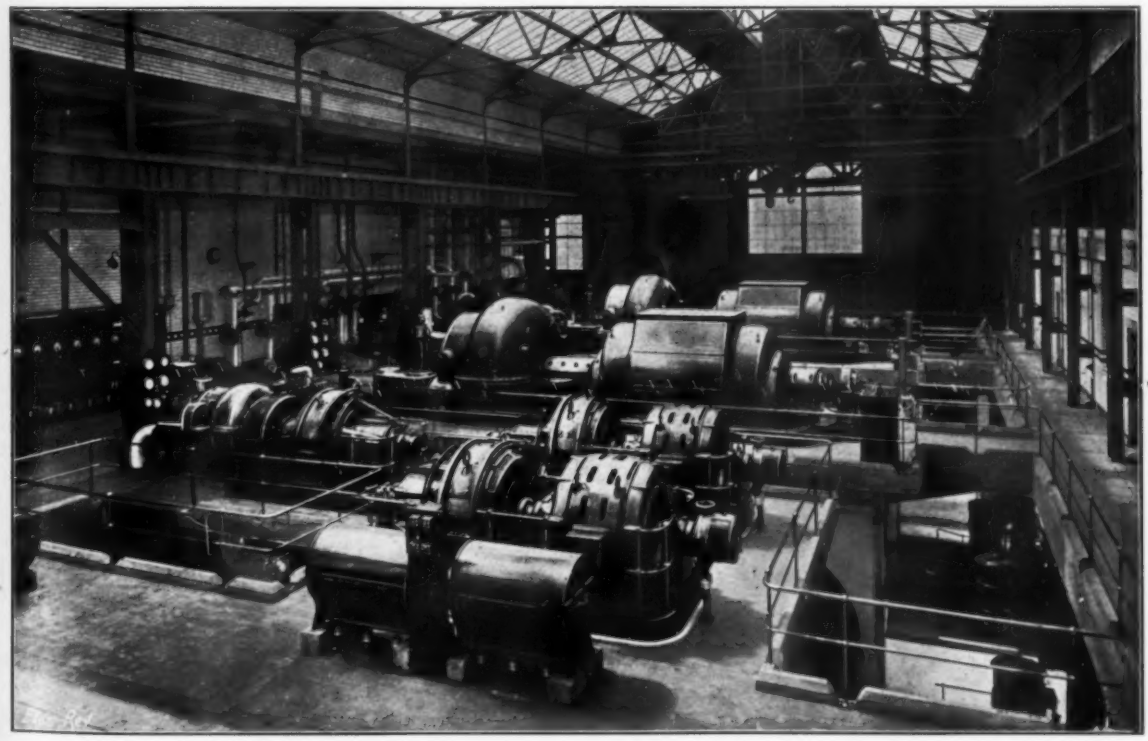

Fig. 2.—The Ribble Turbine Room; House Set and Motor Converters in Foreground.

poses for plant of 150,000 kW capacity. Coal is received by rail at the dockside on the north side of the river, and thence conveyed by an aerial transporter to a receiving tower at the power station, whence it is delivered by duplicate belt conveyors to the bunkers or to the stacking ground west of the station. A jib crane reclaims coal from the stack and delivers it to trucks, which are hauled on a light railway and tipped into a receiving hopper that is also available for road-borne coal, which is elevated by balanced skip hoists to the receiving hopper which serves the belt conveyors over the boiler-house bunkers; the belt conveyors are in duplicate, each being capable of delivering 40 tons per hour.

The ash-removal plant consists of two scraper conveyors working in water-filled cast-iron troughs. A battery locomotive transports the ashes over a narrow gauge railway to low lying dumping ground. The whole of the coal and ash plant has been supplied by the Mitchell Conveyor and Transporter Co., Ltd.

The turbine house, fig. 2, will accommodate three main generating sets, of which two are already installed, and provision has been made for extending the buildings to accommodate a fourth unit. The buildings are of steel, with brick filling, the outside walls being faced with Accrington bricks, and the turbine house is faced with white glazed bricks. The main generating and condensing plant, auxiliaries and house plant has been supplied by the English Electric Co., a considerable portion having been manufactured at the Preston works of the company. Each of the main sets has a continuous normal rating of 12,500 kW at 0.9 power factor, delivering 3-phase current at 50 cycles and 6,600 volts. The sets run at 3,000 r.p.m., and the guaranteed steam consumption at 10,000 kW output is 9.6 lb. per kWh. The turbines have seven stages, each disk carrying a single row of impulse blades, and the governor gear is of the Escher Wyss type. An oil pump lubricates the bearings and the governor relays, while an auxiliary steam-driven oil pump is provided for starting up.

Each turbine is provided with a heater, so arranged that steam may be taken from the low-pressure stages for heating the boiler feed water, and a closed system has been adopted, the water being heated partly by "bled" steam and partly by the exhaust from the feed pumps.

The alternators are totally-enclosed and ventilated on the closed air circuit system by a Heenan and Froude air cooler situated directly underneath in the main foundations.

Each of the main condensers, fig. 3, has 17,000 sq. ft. cooling surface, and is provided with two Drysdale electrically-driven circulating water pumps, situated in a chamber below the turbine house basement, fig. 4. Each pump is driven by a variable-speed motor and is capable of dealing with 85 per cent. of the rated full load. Three Hick, Hargreaves-Breguet air ejectors are provided for each condenser, each being capable of dealing with 50 per cent. of the rated full load. The plant is designed for a vacuum of 29 in., with a barometic pressure of 30 in. when supplied with 13,000 gallons of water per minute at a temperature of 53 deg. F. Duplicate condensate pumps have been installed for each main unit, arranged to deliver to a main header from which two pipes connect to surge tanks above.

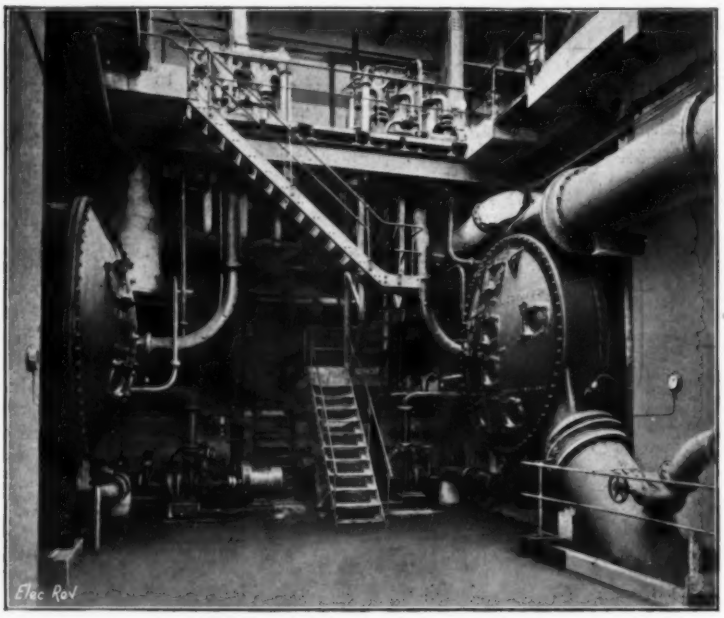

Fig. 3.—Main Condensers in Basement.

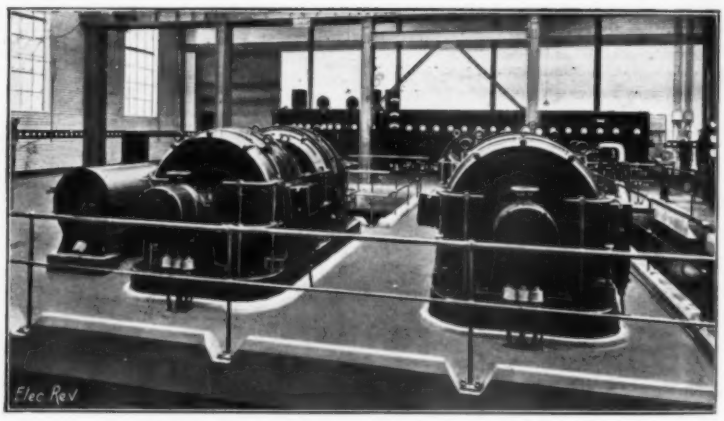

Fig. 5.—Motor Converters and Auxiliary Switchboard.

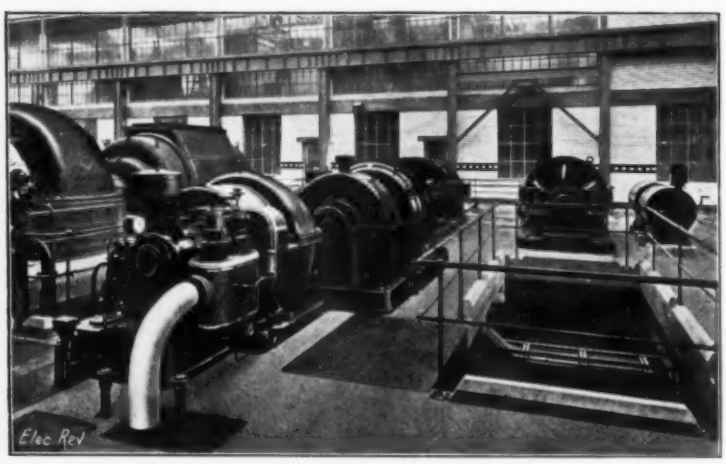

Fig. 4.—House Service Geared Turbo-generator.

Circulating water is taken from the river through a screening chamber equipped with three circular screens, by Messrs. F. W. Brackett & Co., each of 27 ft. diameter. Considerable excavation was necessary to ensure a sufficiency of water between tides, and the inlet chamber has a depth of 6 ft. below the river bed. The inlet and outlet culverts are each 7 ft. 6 in. high by 6 ft. wide, the outlet culvert being above the inlet culvert, and to meet the requirements of the Fisheries Board it discharges over a spillway 100 ft. in length on the river bank.

The whole of the auxiliary plant, except the steam feed pumps, is driven by electric motors supplied with direct current at 220 volts. The auxiliary generating plant comprises one geared steam turbine house set, fig. 4, with condensing plant of 600 kW capacity, two 600-kW motor converters, fig. 5, and a battery, fig. 11, supplied by the Chloride Electrical Storage Co., Ltd., having a three-hour discharge rate of 573 amperes and an emergency discharge rate of 2,000 amperes for fifteen minutes. The d.c. supply is used for lighting the station, and the battery is also employed for operating the h.p. switchgear. It consists of 106 cells, type TJW 12, with Planté design positive and box type negative plates. Each cell contains 12 positive and 13 negative plates, the containers being of lead-lined wood; connections between adjacent cells are burned solid to lead channel bars. Each cell is erected on oil-filled glass insulators supported by a wood stillage, which, in turn, is carried by porcelain oil insulators. The plates are separated by treated wood separators and dowels. The battery is used in parallel with the station auxiliary supply, control on both charge and discharge being normally effected by a hand-controlled booster. Provision is made for automatically cutting out the booster and throwing the battery straight on the busbars in emergency. Charging current is supplied by an induction motor-generator connected to the h.p. a.c. supply. In the boiler house, fig. 6, five Babcock & Wilcox marine crossdrum type boilers have been installed, each having an actual normal evaporation of 65,000 lb. of steam per hour at 325 lb. per sq. in., and 720 deg. F. from water at 100 deg. F. when fired with coal having a calorific value of 10,500 B.th.u. per pound; each is capable of evaporating 75,000 lb. on overload, and space is available for a sixth. When complete the boiler house will contain eight boilers of similar capacity, each complete with economiser, superheater, forced and induced draught plant, steel chimney, and "Diamond" soot blower. Three chain-grate stokers are provided for each boiler, driven from shafts extending along the length of the boiler house under the firing floor, and sectionalised by claw clutches. Four feed pumps are installed, two of the Weir type being driven by steam turbines, and two supplied by Mather & Platt, by electric motors. Each pump is capable of delivering 20,000 gallons per hour against a total head of 900 ft.

Fig. 7.—Switch Room: E.H.P. Cubicles.

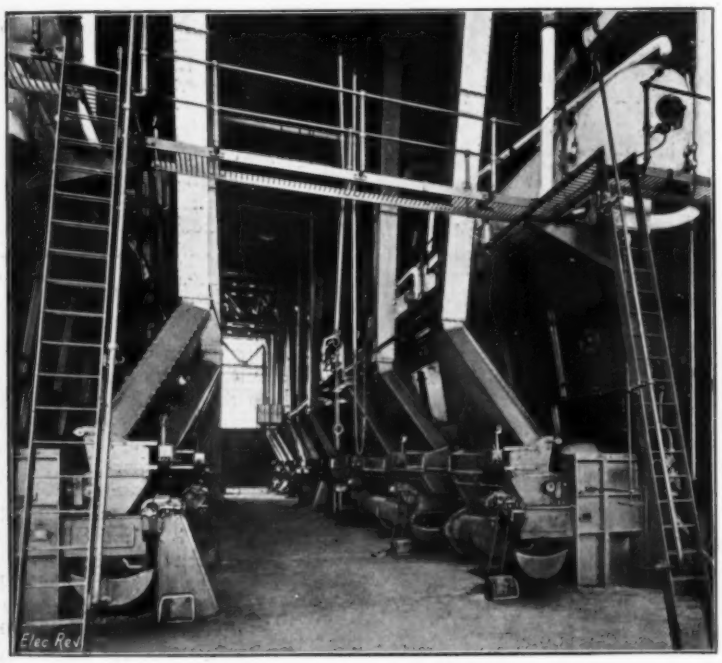

Fig. 6.—General View of the Boiler House.

The h.p. switch room is in the office block, and contains at present ten 6,600-volt cubicles, fig. 7, for controlling the generators and feeders. The gear is completely enclosed in a structure of moulded stone, supported by an angle iron framework. The oil-immersed circuit breakers are three-pole electrically-operated units, each phase being actuated by cams and rollers from a common operating shaft. Normally, the breakers are operated electrically from the control desk, fig. 12, but provision is also made for direct hand

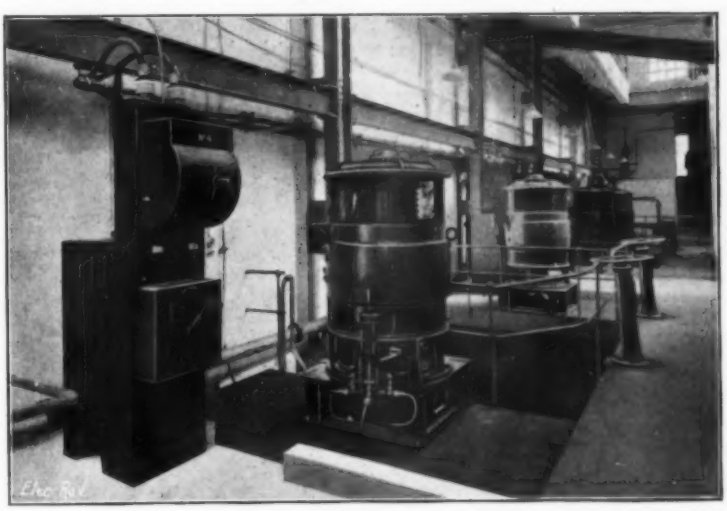

Fig. 8.—Circulating Water Pump Motors in Basement.

operation in an emergency; duplicate bus-bars have been provided throughout. The whole of the h.p. and

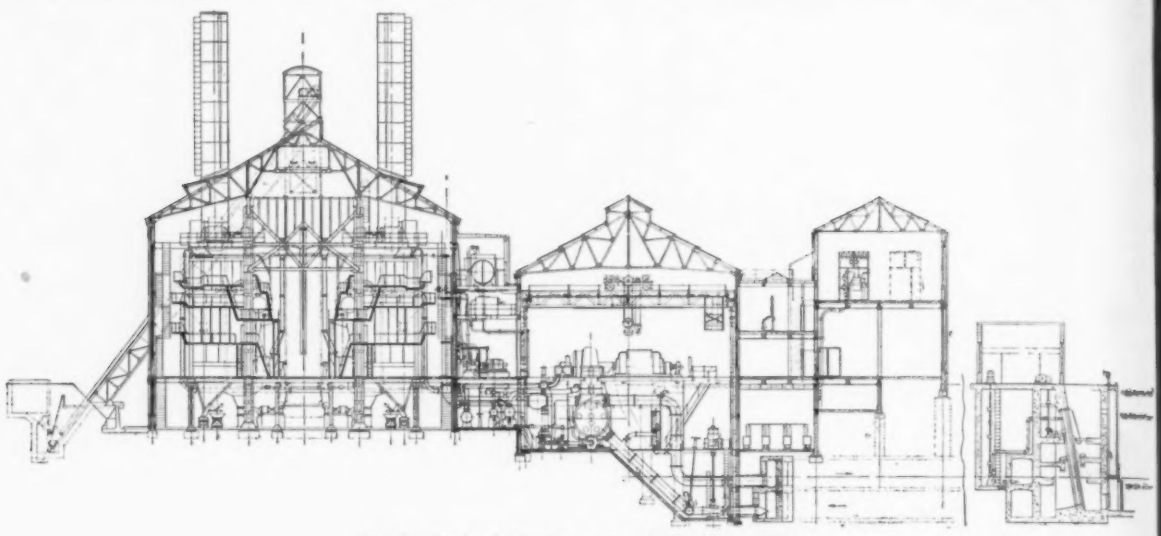

Fig. 9.—Sectional Elevation; New Ribble Power Station.

l.p. switchgear has been supplied by the Metropolitan-Vickers Electrical Co., Ltd. Telegraph communication is available between the control room and the turbine and boiler houses. At present four 6,600-volt feeders have been connected to their respective cubicles; two additional ones will shortly be laid for supplying the borough, and two for feeding the Leyland area at 11,000 volts are being laid.

The control room is situated on the first floor of the office block overlooking the turbine room. Duplicate synchronising gear is provided, and a voltage regulator, the alternators being fitted with Merz-Price protective gear and the feeder circuits with overload time limit and leakage trip relays.

The d.c. switchboard consists of twenty-four panels, and controls the supply from the steam-driven house set, motor generators, and storage battery with duplicate bus-bars. The chief sub-station is in Crown Street, where a portion of the old steam generating plant has been removed to make room for two rotary converters of 500-kW and two of 1,500-

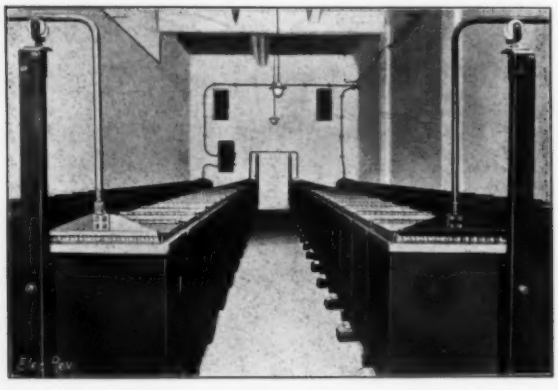

Fig. 11.—A 106-Cell Chloride Battery.

kW capacity; a third set of 1,500 kW is on order. Rotary converting plant has also been installed at the old tramway generating station at Deepdale, and sub-stations have been equipped on the premises of large

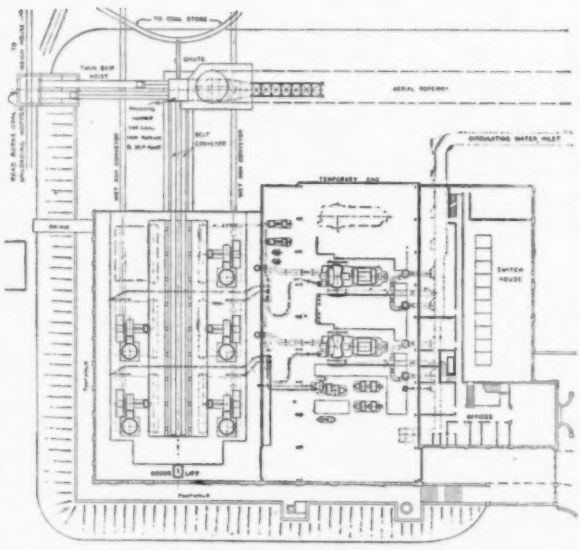

Fig. 10.—Plan; Ribble Station.

consumers, including the English Electric Co.'s works* and Greenbank Mill. A new static sub-station has recently been equipped to supply the Ribbleton district, where the former three-wire d.c. network has been changed over to three-phase.

The step-up transformers of 8,900 kVA capacity, required for the 33,000-volt transmission line to interconnect the Ribble and Blackburn stations, will be placed in an outdoor sub-station to the east of the power station. For this line an induction regulator to give a 10 per cent. plus or minus boost will be employed for interchange of current, and an earthing

Fig. 12.—Switch Control Desk.

transformer is to be installed to enable the 6,600-volt

* See ELEC. REV., July 24th, 1925, p. 145.

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In the later stages the consulting engineer received valuable assistance from Mr. J. F. Simpson, borough electrical engineer, and his staff. Mr. James Barron, Ribble engineer, supervised the preliminary excavation of the site and the river bed, and the formation of the approach roadways.

The Opening Ceremony.

SIR JOHN SNELL, G.B.E., Chairman of the Electricity Commissioners, was Preston's distinguished visitor on July 22nd, when he officially opened the new station. Accompanied by Lady Snell, he privately inspected the station during the morning with Councillor E. A. Heaney, Chairman of the Preston Electricity Committee, and local officials. Later, there was another inspection by Mid-Lancashire civic officials, representatives of chambers of commerce, and industrialists numbering about 200, who assembled in the turbine room to witness the ceremony. The Mayors of Salford, Blackburn, and Lytham-St. Annes attended along with Preston's Mayor and Mayoress, the Town Clerk, Councillor Heaney, Alderman T. Parkinson (chairman and vice-chairman of the Electricity Committee), and Messrs. J. F. Simpson (borough engineer), J. A. Robertson (consulting engineer), A. R. Dickinson (assistant engineer), and D. Shipton Wood (resident engineer).

Severing a silk ribbon, Lady Snell freed the stop valve of the turbine and was presented with a bouquet by the Mayoress. Sir John Snell then started the station. The Mayor presented Lady Snell with a silver rose bowl.

The distinguished company at the luncheon included Mr. S. L. Pearce (of the Electricity Commission), Mr. W. L. Hichens (deputy chairman of the English Electric Co.), Mr. W. B. Woodhouse (president of the Institution of Electrical Engineers), and Lieut.-Col. F. A. Cortez-Leigh (L.M. & S. Railway).

SIR JOHN SNELL trusted the new scheme would bring increased prosperity to the locality; the new station would so affect cost that many industries not hitherto able to afford supplies from public sources would be glad to take it. The Preston station was a model of what a new station should be. Some critics might think it expensive, but they had had to deal with a 22-ft. rise and fall of the river, a transporter arrangement for the conveyance of coal across the river, &c., and though the station would cost £19 per kW. another generating set (for which the building was prepared) would reduce the average cost to £15. He was told that when the next stage was carried out, the cost would be reduced to about £13 per kW.

Sir John added that the day of small isolated stations was coming to a close. The English Electric Co., directly the Corporation put the large station into action, arranged to take the whole of its supply from the new Ribble station, a move which pointed the direction in which things were trending. Out of nearly 500 public generating stations, fewer than 100 contained 2,500,000 kW of plant and the other 300 or so had amongst them 600,000 kW. They would thus get an idea of the relative importance of the few to the many. Last year municipalities produced two-thirds of the total electrical output of the country, and it was to them and to other undertakings that the Commissioners looked for assistance. Last year 68 per cent. of the electrical plant in this country was represented as spare, equivalent to a sum of 30 million pounds sterling. That was the result of their policy in the past of keeping stations independent of each other; it was waste of capital for which the consumer had to pay. If there had been less money expended on spare plant, and more upon transmission, it would have had an all-round benefit.

On behalf of the electrical contractors, Sir John asked Councillor Heaney (Chairman of the Preston Electricity Committee) to accept a memento of the opening in the form of a silver salver.

Councillor HEANEY, in accepting the gift, said it had required breadth of vision to take the steps preliminary to the erection of the station. Having decided to erect it the Corporation began to hunt for a load and made overtures to some of the large cotton mills and power users generally, and then reduced prices, but the results had more than justified their efforts. They had paid approximately £300,000 for the undertaking; spent upwards of £450,000 on the Ribble station; and a further £100,000 on mains, services, and equipment. They built and equipped sub-stations, changed over districts from d.c. to a.c., and managed each year not only to meet the rapidly increasing costs, but to pilot the ship home to harbour with a profit in hand. They had increased the £68,000 gross income of the undertaking in 1922 (when they took it over) to £105,000 last year, and he believed this year it would reach £130,000. Sales at the time of purchase were just over 3,000,000 kWh; last year they were over 8,000,000 kWh. They had 1,950 new consumers, and as a result of an exhibition last year 500 cookers had been installed, or were on order. Some 33 miles of distribution mains had been laid; the demand had increased from 2,500 to 4,500 kW, and they had entered into contracts ensuring a demand of over 10,000 kW during the winter. Further contracts would raise their maximum demand for 1926 to 16,500 kW, so that simultaneously with the official opening of the station they had called a meeting of the Council the following day to consider installing a further 12,500-kW set.*

* At a cost, we understand, of £90,000.—EDS. ELEC. REV.

Alderman ASTLEY BELL (cotton manufacturer) proposed "The Contractors," and Mr. W. L. Hichens (deputy chairman, English Electric Co.), in responding, said the electrical industry was one of the few which had extended its export trade since the war—a great achievement, and it was in the interests of the country that such export should be maintained.

The staff and employés of the Preston Corporation electricity department marked the opening of the station by presenting Mr. J. F. Simpson, borough electrical engineer, with a silver cigarette box and Mrs. Simpson with a silver-plated coffee service and electric percolator. The gifts were handed over on July 23rd as a token of the esteem of the workers for their chief. Mr. D. S. Wood (resident engineer) presided and the presentations were made by Mr. Sydney V. Askew, the youngest and most recent addition to the power staff. Mr. SIMPSON suitably responded.

Tramway and Railway Notes.

Bradford.—PASSENGER SIDING.—The Tramways Committee has approved a scheme for the construction of a tramway passenger siding close to the causeway in Town Hall Street, at an estimated cost of £1,826.

Continental.—FRANCE.—A project for the construction of a suspended electric railway between Paris and the suburb of St. Denis, a distance of about 3¼ miles, has been approved by the Seine Department Authorities. The cars would, it is stated, be constructed of aluminium and would be suspended from a rail at an average height of 56 ft. from the ground.

During June the French Southern Railway Co. converted the Lannemezan-Dax transmission line from 60,000 V to 150,000 V. It is claimed that this is the first line that has been put into operation in Europe at such a high pressure. The line forms part of the company's network which is to supply the railway lines of the company and private industries situated in the district of Bordeaux.

Negotiations are in progress between the Société Electrique Lille-Roubaix-Tourcoing and the municipal authorities of Mouscron regarding the electrification of the light railway between the Belgian frontier and Mont-a-Leux and the railway station at Mouscron and so form a new Belgian connection with the French railway system.

RUSSIA.—*Tramway Electrification.*—The Soviet Government has recently placed a contract with the Elin Gesellschaft, of Vienna, through the Austro-Russian Industry Co., for the electrification of the steam tramway between Baku and Surahani.

ITALY.—It is reported from Naples that, owing to the demand for electricity being greater than the supply, the municipal authorities have recently shut down a number of the electric tramway services in the town.

Greenock.—NON-PURCHASE DECISION.—The Corporation is recommended to intimate to the Tramway Co. that it does not intend to exercise its option to purchase the undertaking when the lease expires in 1928; and that it is willing to negotiate as to the terms and conditions upon which a renewal of the lease might be granted.

Huddersfield.—TRAMWAY LICENCES.—The Watch Committee has granted licences to the Yorkshire (Woollen District) Electric Tramways, Ltd., in connection with a service between Huddersfield and Dewsbury, *via* Bradley, Mirfield, and Ravensthorpe.

India.—BOMBAY.—*Local Electrification.*—The B.B. and C.I. Railway Company has set aside nearly Rs. 7½ crores exclusively to be devoted to works in connection with the Bombay Local Service, and of this amount the equipment, including rolling stock, necessary for the introduction of an electric service, will require Rs. 2 crores approximately. The distance to be electrified in the first instance, that is the line from Church Gate to Borivli, is 21¼ miles. It is hoped to finish the work by January 1st, 1927.

London.—UNDERGROUND SCHEME.—A scheme, involving an expenditure of £25,000,000, to provide a network of goods railways below the level of the present district system and linking up all the big termini and market centres in the Metropolis, is proposed by a party of American and English financiers who have just completed the preliminary plans.

UNDERGROUND INTERRUPTION.—A defect on the supply system caused an interruption on the northbound service of the Bakerloo Railway between the Elephant and Castle and Piccadilly on July 22nd shortly after 10 o'clock. Trains running north from the terminus at Elephant and Castle were delayed while the defect was remedied. After a delay of about 30 minutes the service was restored.

Middlesbrough.—LOAN SANCTIONED.—Application has been made to the Ministry of Transport for permission to borrow £933, which is one-third of the total amount of £2,800 required in respect of the extension of the Tees-side Railless Traction Board's undertaking. Sanction has been granted to borrow £588 as the Corporation's proportion of the cost of a new petrol-electric trolley vehicle for use on the railless traction system.

Sunderland.—CONVERSION TO 'BUSES.—The Sunderland District Tramways have made a complete change-over from trams to motor-'buses, and the track and overhead tramway equip-

ment are being dismantled. Bolton Corporation has bought eight of the discarded tramcars and Grimsby Corporation has bought 16. The company has now a fleet of 58 motor-'buses covering a much wider area than the trams served.

United States.—RAILWAY ELECTRIFICATION.—The New York Central R.R. has been ordered by the Public Service Commission of the State of New York, says the *Railway Review*, to submit plans and specifications on or before September 1st, 1925, covering the electrification of its line from Spuyten Duyvil Creek to and including the 60th Street yard in New York City. Under the Order the New York Central is also required to submit on or before September 1st a statement of the detailed plans showing the method by which it will electrify its lines in New York City south of the 60th Street yard. The Commission granted an extension of time until September 1st in which plans for the electrification of the Putman Division and the Saw Mill River branch are to be filed.

West Hartlepool.—EXTENSION OF SPECIAL ORDER PERIOD.—The Minister of Transport has directed that the periods stipulated for the commencement of the works and for the completion and opening for public traffic of the tramway authorised by the West Hartlepool Corporation Tramway Order, 1912, shall be prolonged so as to expire on August 7th, 1926, and August 7th, 1927, respectively.

Telegraph and Telephone Notes.

Radio Navigational Aids.—COMMITTEE OF INQUIRY.—The Board of Trade Committee which is to inquire into the use of wireless in navigation will, says *The Times*, be as follows:—Sir R. Burton Chadwick, M.P. (chairman), Wing-Commander G. P. Grenfell, R.A.F., Mr. S. J. Lister, Commander F. Loring, R.N., Vice-Admiral G. R. Mansell, the Hon. Alexander Shaw, Captain J. R. Somerville, R.N., and Mr. J. R. Willis (secretary). The terms of reference are "... to advise the Board of Trade regarding the development in the United Kingdom of the service of wireless direction-finding stations, wireless beacons, and similar aids to navigation, and the location and types of such stations to be maintained."

Storm Damage.—Nearly 10,000 telephones were put out of action by the thunderstorm which broke over Paris during the evening of July 24th. The Ségur exchange subscribers were entirely cut off owing to the bursting of a sewer, and the Fleurus and Vaugirard exchanges were seriously affected. The lines of the Bourse and most of the Government offices have been restored, says *The Times*, but repairs to the Ségur exchange will take some days.

Storms also interfered with the service in this country last week. In the London area 1,200 lines were out of action, Ilford with 250 having the largest total. Of the Continental lines, most damage occurred to the Paris service, eight of the 16 lines developing faults, and one of the three lines to Antwerp was damaged. In the inland trunk service, 188 lines out of 830 were out of action.

The Telegraph Service.—DEFICIT.—When the Post Office estimates came under review in the House of Commons recently, the Postmaster-General stated that the telegraph, from the financial point of view, was the least satisfactory of the Department's services. Last year's deficit amounted to £1,300,000, which, he said, was due to the competition of the telephone service. The number of telegrams sent last year by Government Departments was only half the previous year's total.

The Telephone Service.—LARGE PRIVATE AUTOMATIC SYSTEM.—On July 27th, a large private automatic telephone exchange system was opened at the head office of the Port of London Authority. In addition to its size, a feature is the complete provision of inter-communication facilities over the very wide area covered by the dock system of the Port of London, which extends from London to Tilbury on the north side of the river and to Gravesend on the south. Each of the five dock groups has direct communication with the Post Office exchange system, and a telephone directory has been prepared by the P.L.A. giving particulars of the lines joined up by this automatic system.

TELEGRAPH MONEY BILL.—The Telegraph Money Bill, 1925, which came before the House of Commons last week, will authorise the issue of £30,000,000, which, when added to the unexpended balance available from the Act passed in 1924, will meet the capital requirements of the telephone service for about three years. *The Times* reports Sir W. Mitchell-Thomson, Postmaster-General, as having said that he had deliberately adopted the policy of laying down a programme over a period of years in the interests of the efficiency of the Post Office and of the industry concerned. He had in hand £9,400,000, which would make up a total of £39,400,000. It was intended to spend in three years £35,000,000, which would leave a balance in hand on April 1st, 1928, of £4,400,000, or, at the rate of £1,000,000 a month, about 4½ months' supply. He proposed to spend £2,500,000 during next year on the extension of the underground system. At present, in proportion to the length of the telephone service, they had got as much wire underground as the United States, if not more.

PUBLIC KIOSKS.—It is proposed to erect telephone kiosks for public use at several points in Golders Green and Hendon.

Radio Notes.

Daventry Station Opened.—On July 27th, Sir W. Mitchell-Thomson, Postmaster-General, inaugurated the new high-power broadcasting station in Northamptonshire. Situated practically in the geographical centre of England and on the summit of Borough Hill (1½ miles from Daventry), which is 600 ft. above sea level, the two lattice steel masts are 500 ft. high, so that the aerial is about 1,100 ft. above sea level. The call sign remains 5XX and the wave-length 1,600 in., while the mean input to the plates of the magnifier valves will be 25 kW, which power can be augmented when necessary.

Russia.—RADIO DEVELOPMENT.—Russia, through a broadcasting company operating on similar lines to the B.B.C. in this country, is making a bid to become one of the leading European countries using wireless for entertainment purposes. The Russian broadcasting company has nothing to do with the Soviet Government beyond working under a concession which has been granted to it, and at present it has six stations in operation—four in Moscow and one each in Leningrad and Kiev, South Russia. According to the *Evening News*, representatives of the company have recently been in England buying apparatus. The principal station in Moscow, where there are 300,000 licensed listeners, was formerly the old Russian Post Office station, and transmits on a wave length of 1,450 metres at a power of 12 kW. Work is already in hand to reconstruct this station and increase its power to 50 kW in the aerial. This work will be finished by September, and during the next few weeks four other stations, now nearing completion, are to be opened. Two will transmit at 4 kW and two at 2 kW. Then before next March no less than 30 other broadcast stations are to be erected.

Time Signals.—NEW CODE.—One of the principal objects of the International Service of Wireless Time Signals is to ensure that no ship, in whatever remote seas she may be sailing, shall ever be out of reach of them. The co-ordination of such signals can only be attempted by an international authority, and the International Astronomical Union's *Commission de l'heure* met on July 17th for a critical discussion of the relative merits of the various codes and the times at which they should be transmitted, particularly in Western Europe. The decisions have not yet been officially announced, but *The Times* understands that it has recommended the abolition of the old Paris code as still transmitted from FL at 10.45 a.m. and p.m. and the adoption of the International Code with the difference that, in place of the last three dashes, each of the three minutes shall end with the six dot seconds as transmitted by 2LO. This scheme was brought forward by the British Horological Institution, whose chairman, Mr. Frank Hope-Jones, was responsible for the original suggestion and arrangements for broadcasting the Greenwich dot seconds.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—MELBOURNE.—September 14th. State Electricity Commission. 3,000-kVA transformers and spares.*

State Electricity Commission. September 21st. 250-kVA. 22,000-V transformers and spares.

September 15th. Postmaster-General's Department. (Sched. C. 36). Telegraph equipment. Tender forms from High Commissioner, London.

NEW SOUTH WALES.—New South Wales Railways. October 7th. One 20,000-kW turbo-alternator for White Bay power house.

NEWCASTLE.—September 22nd. Caledonian Collieries, Ltd. Ward-Leonard electric winding engine for Aberdare central colliery complete with balancer, exciter, and the necessary switchgear.

Bristol.—August 10th. Docks Committee. Four 3-ton movable electric jib wharf cranes for the Royal Edward Dock, Avonmouth. Spec. (£3) from Mr. T. A. Peace, chief engineer, Avonmouth Docks.

India.—August 5th. India Store Department. Electric ceiling and table fans. (July 24th.)

August 11th. 313-kVA 3-phase alternators and exciters and accumulator cells. (July 24th.)

Kettering.—August 28th. Electricity Works. One cooling tower and tank circulating water pipes. (See this issue.)

London.—ST. PANCRAS.—September 3rd. Electricity Department. One 10,000-kW steam turbine, alternator, condensing plant, pipes, &c. (July 17th.)

ST. MARYLEBONE.—August 31st. Highways Department. One 200-kW turbo-alternator set with surface condenser and auxiliaries; one second-hand 200-kW, 200/220-V d.c. generator set. (July 17th.)

August 26th. METROPOLITAN ASYLUMS BOARD.—Installation of additional electric lighting at North-Eastern Fever Hospital, Tottenham. (See this issue.)

Manchester. — August 7th. Electricity Department. Three-phase, 6,600-V switchgear for Dickinson Street and 6,600-V switchgear for Bowker Vale. (July 17th.)
August 18th. One water-tube boiler, &c. (July 24th.)
August 11th. Tramways Committee. Supply and delivery of steel girder tramway rails, steel fishplates, steel clip plates and coach screws. Specifications and forms of tender from Mr. H. Mattinson, general manager, 55, Piccadilly, Manchester.

Newbury.—August 10th. Board of Guardians. Electrical generating plant at the Poor Law Institution. (See this issue.)

Newport (Mon.).—August 15th. Electricity Department. Ferro-concrete foundations for a 10,000-kW turbo-alternator and condensing plant, and one 49/50-ton engine-room crane, &c. (July 24th.)

New Zealand.—WELLINGTON.—September 22nd. Post and Telegraph Department. Bituminous tape.*

Nottingham.—August 7th. Electricity Department. One 20,000-kW turbo-alternator, with exciter, condenser, air pumps, oil coolers, air coolers, and auxiliary plant. (July 17th.)

Oban.—August 4th. Town Council. Electric lighting work at six blocks of houses. Specifications from Burgh Surveyor.

Preesal.—August 17th. Urban District Council. 6,600-V cables, l.p. distribution and service cables, including excavation and reinstatement. (July 24th.)

Shipley.—August 5th. Education Committee. Installation of electric light at four Council schools and the Salt High Schools. (See this issue.)

South Africa. — JOHANNESBURG. — September 3rd. South African Railways and Harbours. Five 4-wheeled traversers and two tractors.*
October 13th. Electricity Supply Commission of South Africa. Equipment and buildings for an electric power station at Durban:—Complete boiler-house equipment, also other plant and piping; boiler-house installation, including pulverised fuel equipment with buildings, piping and other plant; steel frame buildings; overhead electric travelling crane; coal and ash-handling plant; two 12,000-kW turbo-alternators; condensing plant and auxiliary apparatus; transformers for power station; and switchgear and auxiliary plant. (See this issue.)

BULAWAYO.—September 29th. Municipal Council. Plant for the extension of the electricity works.*

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room) 35, Old Queen Street, S.W.1.

Closed.

Australia. — SYDNEY. — Electricity Committee. Recommended:—
30,000 electricity meter coils (£599).—Weldon Electric Supply Co., Ltd.

Bexhill.—Electricity Committee. Recommended:—
Cable: Enfield Cable Works (£305); British Insulated & Helsby Cables, Ltd. (£385 12s. 2d.).
Meters, about 700.—Electrical Apparatus Co., Ltd.

Birkenhead.—Electricity Committee. Accepted:—
Six miles 7/16 single-core cable (£179 5s. per mile).—Liverpool Electric Cable Co., Ltd.
Two 200-kVA transformers (£199 10s. each) and two 150-kVA transformers (£172 each).—English Electric Co., Ltd.
Switchgear at New Ferry and Bebington sub-stations (£1,054).—Metropolitan-Vickers Electrical Co., Ltd.

Birmingham.—Education Committee. Accepted:—
Electric lighting of elementary schools.—Alston Road, Bordesley Green (£980), Messrs. Lewis & Hall; Witton Lodge, Erdington (£734), Messrs. Lea, Son & Co., Ltd.

Bradford.—Electricity Committee. Accepted:—
Extension of Odsal sub-station building.—Thos. Obank & Son, Ltd.
25-ton lifting gear for transformers at Valley Road works and Thornbury sub-station.—Herbert Morris, Ltd.
1-ton cable trailer.—R. A. Dyson & Co., Ltd.

Bolton.—Corporation. Accepted:—
Meters.—The Edison Swan Electric Co., Ltd.

Cheltenham.—Electricity Committee. Accepted:—
Cables.—British Insulated & Helsby Cables, Ltd.
Meters.—Metropolitan-Vickers Electrical Co.

Chester.—City Council. Accepted:—
Meters.—The Edison Swan Electric Co., Ltd.

Chesterfield.—Electricity Committee. Accepted:—
5,500 yd. distributor cable.—British Insulated & Helsby Cables, Ltd.

Colchester.—Education Committee. Accepted:—
Installation of electric light at St. John's Green School (£106).—E. Bailey.

Dunstable.—Town Council. Accepted:—
Wiring houses for electric light at £6 per house.—Mr. S. F. Goodwin.

Hawarden.—The Hackbridge Electric Construction Co., Ltd., informs us that the R.D.C. order for sub-station transformers has been placed with it, and not as already reported.

Irish Free State.—DUBLIN.—Contracts placed by the Controller of Stores, Department of Posts and Telegraphs during June, 1925:—
Bronze wire.—F. Smith & Co.
Copper wire.—R. Johnson & Nephew.
Electric motor.—Metropolitan-Vickers Electrical Co., Ltd.
Insulators.—W. F. Dennis & Co.; Taylor, Tunnicliffe & Co., Ltd.; Wm. J. Kellie.
Telegraph accessories.—Murray Printing Telegraph Systems, Ltd.; J. Carpentier.
Telephone accessories.—India Rubber, Gutta Percha and Telegraph Works Co., Ltd.; J. McMillan & Co.; J. Thompson.
—*Irish Electrician.*

Post Office. Accepted:—
Dry cells.—The Edison Swan Electric Co., Ltd.

Leeds.—Electricity Committee. Accepted:—
Cables.—W. T. Henley's Telegraph Works Co., Ltd. (£7,664); Enfield Cable Works, Ltd. (£2,771); Macintosh Cable Co., Ltd. (£1,974).
Sub-station at Armley (£480).—Messrs. J. Ferguson & Son, Ltd.
Sub-station at Quarry Mount (£465).—Mr. S. J. Flockton.

Lewes.—Education Committee. Accepted:—
Wiring schools for electric light (£137).—Mr. H. J. Galliers.

London.—POPLAR.—
The Electricity Committee recommends placing with International Combustion, Ltd., as prime contractors, the following orders for the extension at the electricity works:—
Main buildings (£23,505); foundations (£3,410).—Mitchell Conveyor Co.
L.p. main switchboard (£2,300).—George Ellison.
Wiring of motors (£1,675).—W. T. Glover & Co., Ltd.
Maconite cable, &c. (£910).—International Combustion, Ltd.
Distribution boards (£820).—Parmiter, Hope & Sugden, Ltd.
Station lighting (£625).—International Combustion, Ltd.
Motors, &c. (£122).—Veritys, Ltd.
Starters and gear (£177).—Brookhirst Switchgear, Ltd.
Modification of one boiler (£350).—Vickers Spearing Boiler Co., Ltd.
Treatment of circulating water (£340).—Paterson Engineering Co., Ltd.
Ash sluicing equipment (£1,490).—Underfeed Stoker Co., Ltd.
Surge and storage tanks (£1,056).—International Combustion, Ltd.
Additional batteries (£722); switchgear (£25).—Hart Accumulator Co., Ltd.

GREENWICH.—Board of Guardians. Accepted:—
Installation of electric light in the West Block of the Institution (£319).—Electrical Installations, Ltd.

Perth.—Electricity Committee. Recommended:—
New economiser for the electricity works.—E. Green & Son, Ltd.

Stoke.—Electricity Committee. Accepted:—
Electrical interlocks for conversion sets at Longton and Stoke sub-works (£53 each station).—Metropolitan-Vickers Electrical Co., Ltd.
New battery for electric vehicle (£172).—Chloride Electric Storage Co., Ltd.
L.p. switchgear (£803).—Berry's Electric, Ltd.
Wiring at central power house extension (£1,142).—Barnett & Soans.
Grab crane (£3,091).—Alex. Jack & Co., Ltd.
Two 25-kVA transformers (£116).—Metropolitan-Vickers Electrical Co., Ltd.

Warwick.—Board of Guardians. Accepted:—
Installation of electric light at the Infirmary (£497).—Ellis & Ward, Ltd.

Forthcoming Event.

Institution of Electrical Engineers (London Students' Section).—Summer Meeting in London. July 25th to August 1st.

Notes.

Wireless Societies.—At the invitation of the Committee of the Wireless Section of the Institution of Electrical Engineers, Mr. James Nelson was present at a meeting of the Committee held on July 25th, when the question of a suggested new wireless society was discussed with him. A statement on the subject will shortly be published, but it is stated that the definite conclusion has been arrived at that there is no need for a new body.

New Belgian Electro-Technical Association.—The Comité Electrotechnique Belge has been formed by representatives of various electrical associations in Belgium to represent Belgian interests on the International Electrotechnical Commission and to deal with electrical standardisation questions in Belgium.

British Engineering Standards Association. — The B.E.S.A. held its 7th annual general meeting on July 9th, when the chairman, Sir Archibald Denny, Bart., took a more hopeful view of affairs than was possible 12 months ago. The balance sheet showed that the deficit carried forward from the previous year had been reduced from over £1,900 to £677; he regretted, however, that owing to there being at the present time no further funds for the purpose, the valuable work of translating the British standard specifications into foreign languages and disseminating them abroad had had to cease.
For some time past the Association has had under consideration suggestions for widening the scope and influence of its work, and we are now informed by the secretary, Mr. C. Le Maistre, that the Main Committee has decided to enlarge the membership, so as to enlist the active support of professional engineers, industrial firms, and business men connected with all the great industries of the country, who are invited to become members at a minimum annual subscription of two guineas. Technical and trade organisations connected with the work of the B.E.S.A., as well as public utility undertakings, are also eligible, while the members of the Technical

Committees, who give their time and experience to this national work without fee or recompense and who now number some 2,300, are in future to be known as honorary members. All members will be entitled to privileges, including direct representation on the Main Committee through a duly elected Advisory Council, as well as being able to apply to the organisation for advice on any matters of simplification or standardisation as carried on in this country and in the other large producing countries. Present contributors are being invited to become members without additional fee and are being asked to maintain their present contributions.

As an E.C.A. representative of the B.E.S.A., Mr. W. R. Rawlings, in an appeal for new members, points out that the annual report contained some interesting figures; for instance, the number of committees was 474; members of committees numbered 2,294; the number of new and revised specifications issued during the year was 54; the sale of specifications increased during the year by over 10,000; and the total sale of specifications per year amounted to 54,405.

The carrying out of the above, including the working of the whole organisation, cost only £16,729, which Mr. Rawlings thinks all must agree, shows that the B.E.S.A. is one of the most economical associations in existence.

Appointments Vacant.—Shift charge engineer, for Lancaster Corporation electricity department; assistant shift charge engineer, for St. Marylebone Council electricity department; Diesel engine fitters, for the Gold Coast Government Railway (£980-£12-£480 per annum); boiler house assistant engineer and two junior generation assistants, for the Hull Corporation electricity department; clerk for the Sevenoaks and District Electricity Co., Ltd. The Walsall Corporation is advertising for a tramway manager to succeed Mr. C. Burgess, who is leaving for an appointment in the East. The salary offered is £800 per annum, rising by £50 per annum to £900. (See our advertisement pages to-day.)

American Electric Vehicle Progress.—Endorsing the sales promotion campaign conducted last year by the Society for Electrical Development, representatives of all the leading electric truck and battery manufacturers in America at a recent meeting in New York subscribed a tentative budget of £5,000 for a similar campaign for 1925. A well-defined programme of sales promotion, embracing the preparation and distribution of special articles for trade journals and newspapers, will be put into effect. There will also be special studies dealing with the logical relation of central stations to the electric truck industry. During the past four years the number of electric trucks in use in the United States is said to have shown an increase of 64 per cent.

It is announced from Detroit, U.S.A., that Mr. Ernest M. Howe, who is described as a British transportation expert, has been elected president of the Gray Motor Corporation, and that the concern has obtained exclusive manufacturing rights in America for Tilling-Stevens petrol-electric 'buses, all parts of which, except the electrical equipment, are to be made in the United States.

Second World Power Conference.—In continuation of the work initiated by the First World Power Conference at Wembley last year the *Financial World* announces that the International Executive Committee held its first meeting, under the chairmanship of Mr. D. N. Dunlop, director of the British Electrical and Allied Manufacturers' Association, in London on July 27th. Twenty countries sent representatives, among them being the United States, India, Canada, Australia, New Zealand, France, Germany, Italy, Holland, Switzerland, Sweden, Russia, Norway, Denmark and China. Mr. O. C. Merrill, secretary of the Federal Power Commission, was the delegate for the United States; M. Tribot-Laspiere, director of the Union des Syndicats de l'Electricite, for France; Mr. Conrad Matchoss, director of the German Engineering Association, for Germany; Mr. J. W. Meares, electrical adviser to the Government of India, for India; Dr. E. Tissot, President of the Swiss Association of Electricians, for Switzerland; Mr. J. G. Bellaar Spraijt, President of the Association of Electrical Companies, for Holland; and Mr. S. Klouman, of the Aluminium Company, for Norway.

South Devon Inquiry.—The Torquay Corporation, the Salcombe, Ashburton and Kingsbridge Urban Councils, and the Newton Abbot and Kingsbridge Rural Councils, were represented at an inquiry opened by Col. T. C. Ekin, chief engineering inspector of the Electricity Commission, at Newton Abbot on July 21st and 22nd, into the applications made by Mr. Raymond Hartree, of Salcombe, for an order empowering him to supply electricity in central South Devon, and by the Teignmouth Electric Lighting Co., Ltd., for a similar order relating to parts of the same rural district. In the case of Mr. Hartree it was said that he was prepared, if his application was granted, to give a bulk supply to Teignmouth; he did not wish to hamper the Teignmouth undertaking, but when he had done the work and spent the money it was not fair for a company to come in at the eleventh hour and be granted the cream of the area. It was cheaper to run the gas and electricity undertakings together rather than separately, and he had already spent £4,500 in connection with the order. He also had an option to purchase the Dartmoor Electricity Supply Co. Mr. Uttley, of Sir Charles Bright and Partners, Ltd., gave details of the work necessary to be carried out by Mr. Hartree under the proposed order, the total cost involved being £36,700.

For the Teignmouth Electric Lighting Co. it was said that Mr. Hartree's application was two years old, and the Teignmouth Co. had been held up very considerably by the fact that a competing application was in existence. The Teignmouth Co. was anxious in the autumn of last year to lay a cable between Torquay and Teignmouth, and but for Mr. Hartree's application being in existence might have laid a main last year. As a result of not being able to do this some temporary plant had to be put down. It was urgent that the company should get permission to lay a cable now between Torquay and Teignmouth. If it could not do this it would have to put down more temporary plant. The Teignmouth Co. considered that as it was taking energy from Torquay it would be a natural sequence and in the interests of the area it desired to serve that it should have this order. The company was anxious to supply Shaldon, which had no gas supply, and was going to take a main over there this year if it could. At Teignmouth the company had four 60-h.p. engines or four 40-kilowatt sets, and one 10-kilowatt set, a total of 170 kilowatts. The demand last winter was 142.2 kilowatts, and the company was estimating for 190 kW by Christmas next and 400 kW in four years. It was proposed to charge 10d. per kWh for lighting in the extended area, provided no abnormal circumstances arose, and 5d. for power, with discounts for large users.

It was suggested that £6,000 would be a very generous offer for the Dartmoor Electricity Supply Co.'s concern, and in reply, for Mr. Hartree, it was pointed out that the Teignmouth Co. was hardly larger than the Dartmoor Co.

Subsequent to the ending of the inquiry, Col. Ekin made a tour of the districts concerned.

Institution Notes.

Institute of Metals.—The programme of the annual autumn meeting has just been issued. The meeting opens in Glasgow on September 1st with a lecture by Sir John Dewrance, K.B.E., on "Education, Research, and Standardisation." The mornings of September 2nd and 3rd will be devoted to the reading and discussion of sixteen papers dealing with many differing aspects of metallurgical work. In the afternoons visits will be paid to works in the Glasgow district, and in the evening of September 2nd a reception is to be given by the Lord Provost and Corporation of Glasgow. The concluding day of the meeting, September 4th, is set apart for a visit to the Trossachs and Loch Lomond.

Institution of Electrical Engineers.—SOCIETY OF RADIOGRAPHERS.—The Council of the Institution of Electrical Engineers, which took an important part in founding the Society of Radiographers in 1920, and under that Society's constitution has hitherto nominated six out of the eighteen members of the Society's Council, has withdrawn its nominees and terminated the Institution's connection with the Society. This action has been taken because the majority of the Council of the Society of Radiographers has resolved upon certain alterations of the Society's articles, with which the Council of the Institution is in entire disagreement, as in the I.E.E. Council's opinion these alterations will materially lower the professional status of non-medically qualified radiographers.

Institution of the Rubber Industry.—The final for the Wallwork Challenge Cup, under the auspices of the Golf Section of the Institution, was played off at Sunningdale on July 17th, the winner being Mr. E. A. Utley (Birmingham). Mr. H. Standring, in presenting the cup, regretted the absence of Col. Wallwork and Mr. J. H. C. Brooking, a vice-president of the Institution.

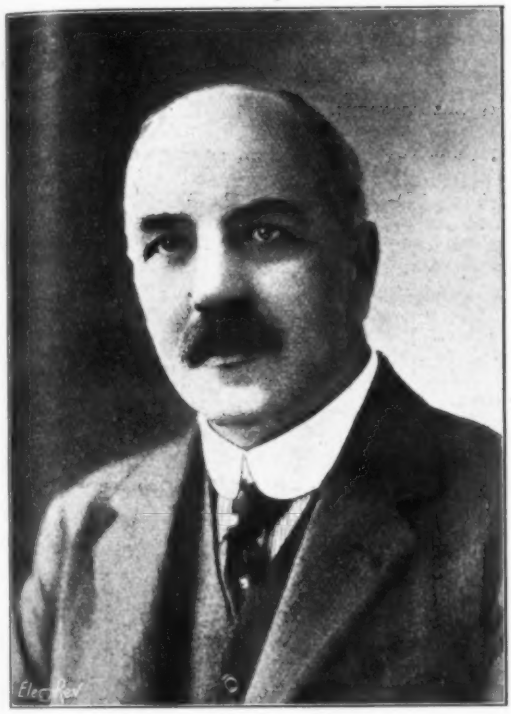
Royal Society.—SUMMER CONVERSAZIONE.—The Society held its second soirée of the year at Burlington House on July 22nd, and was honoured with an afternoon visit from the King and Queen, who examined the exhibits and were present at a lantern lecture by Mr. F. E. Smith on "Navigational Devices." A source of interest to their Majesties was the display of "Telephotographs" (see ELEC. REV., July 24th, 1925).

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements).

MR. JOSHUA KIDD BRUCE, whose appointment as general manager of the London County Council Tramways Department in succession to Mr. A. L. C. Fell, was confirmed at the Council meeting last week, is 53 years of age. Mr. Bruce, for the greater part of a year during the war, while Mr. Fell was absent owing to illness, was in charge of the tramway system. The General Purposes Committee, in reporting that it was in the best interests of the service that he should be appointed general manager said:—"He has had intimate experience of the working of the Council's system as traffic manager for 15 years, and as deputy chief officer of tramways for 6½ years. He is a member of the Council of the Institute of Transport, and from November, 1919, to January, 1925, was a member of the Sub-Committee of the Advisory Committee on London

Traffic which dealt with traffic regulations. We are informed that for the last six months Mr. Bruce has been very successful in operating the Council's tramways, and has initiated several improvements of a striking character which have effected considerable saving. We have no hesitation in recommending Mr. Bruce for the appointment."



P. & A. Photos. [*London.*

Mr. J. K. Bruce,
General Manager of the L.C.C. Tramways.

The address of Mr. O. C. WAYGOOD, hon. secretary of the Mersey and North Wales (Liverpool) Centre of the I.E.E., is now Astbury, Forest Road, Meols, Hoylake, Cheshire.

Mr. W. WEEKES, chief assistant electrical engineer under the Shoreditch Borough Council, has been appointed borough electrical engineer, on probation for a period of twelve months, at a salary of £850 per annum, in succession to Mr. C. Newton Russell, who is retiring at the end of the year. Mr. Weekes has been in the service of the Council, or the Vestry which preceded it, since 1897.

Captain A. D. NEWBURY has resigned from the staff of Messrs. Sparks & Partners, consulting engineers, on appointment as chief assistant engineer to the Notting Hill Electric Lighting Co., Ltd.

The Hon. A. G. V. PEEL has joined the board of the Globe Telegraph and Trust Co.

Mr. HERBERT W. WATTS, who, as stated last week, has been appointed electrical engineer to the Epsom Urban Council, is power station superintendent in the Cheltenham Corporation Electricity Department. There were 92 applications for the post at Epsom.

Mr. CECIL GRIFFITHS, who has for the past three years held an appointment in Persia with the Anglo-Persian Oil Co., has been appointed commercial electrical engineer at Calcutta for the firm of Alex. Laurie & Co., London, and he left for India on July 11th.

The German Society of Engineers awarded the Grashof medal—its highest order of merit—to Dr. ING. OSKAR VON MILLER on the occasion of his 70th birthday. Dr. Miller is regarded as the pioneer of hydro-electric work in Germany.

The Halifax Tramways and Electricity Committee has increased the salary of Mr. ROGERSON, the borough electrical engineer, by £120 per annum in order to bring it into conformity with the recognised scale.

On Monday last, Mr. S. L. PEARCE, who has become a member of the Electricity Commission, was honoured at a farewell luncheon at the Town Hall, Manchester. Alderman Dagnall, chairman of the Electricity Committee, presented Mr. Pearce with an illuminated address.

On July 20th, Mr. GUY BURNEY was the principal guest at a dinner held at the New Hotel Metropole, when 26 of his associates representative of the whole telephone industry, met under the chairmanship of Sir Hugo Hirst, Bart., to express their esteem and to bid him farewell on his resignation of the managing directorship of the Sterling Telephone and Electric Co., Ltd. Sir Hugo proposed the toast of the guest of the evening, which was received with musical honours. He then presented Mr. Burney with a six-branch cut-glass candelabra on behalf of the assembly. He remarked that he and most of the guests had known Mr. Burney for a very lengthy period, many of their friendships going back over a period of a quarter of a century, and although their business interests had often been opposed, they had always remained friends. Mr. Burney, in a reply which was reminiscent of his long career, hinted that after enjoying a well-earned holiday he might return to the industry in some capacity or other. Other speeches followed.

Obituary.—MR. G. F. C. PRATT.—The death took place on July 22nd, at Gloucester, of Mr. George Frederick Charles Pratt, who at the age of twenty went to America to develop his experience, and was eventually appointed superintendent of the Bell Telephone Co. at Philadelphia. He returned to England in 1900, and joined the engineering staff of the National Telephone Co. When the undertaking was transferred to the Government he was appointed assistant engineer in the Post Office Telephone Department, at Gloucester, and he retired under the age limit in April, 1924. He was 62 years of age.

New Companies Registered.

Gil-Ray Trading Corporation, Ltd. (207,400). — Private company. Registered July 21st. Capital, £2,000 in 2,000 ordinary shares of 5s. and 1,500 preference shares of £1. Objects: To acquire the undertaking and all or any of the assets and liabilities of Allan C. Gilmour, trading as Gil-Ray Radio Co. and Gil-Ray Trading Corporation, together with the trade mark "Gil-Ray," No. 452,575, and to carry on the business of wireless manufacturers and factors, metal and general merchants, store keepers and universal providers. The life directors are:—A. C. Gilmour, 42, Bacon Lane, Roe Green, Kingsbury, N.W.9, secretary; I. J. Lithauer, 7, First Avenue, Hove, manager (managing director). Qualification (except first directors), £250. Remuneration, £250 each per annum. Registered office: 35, Sicilian House, Southampton Row, W.C.1.

Gilfillan Brothers, Ltd. (207,424).—Private company. Registered July 22nd. Capital, £2,000 in £1 shares. Objects: To acquire the business of Gilfillan Brothers carried on by H. W. Cook at 63, High Holborn, W.C.2, and to carry on the business of manufacturers of and wholesale and retail dealers in wireless apparatus and the components parts thereof, &c. The directors are:—H. W. Cock, 64, Elm Grove Road, Barnes, Surrey; S. M. Forwood, 22, The Drive, Loughton, Essex; C. L. Weller, Bendrose House, Amersham Common, Bucks. Qualification, 200 shares. Remuneration, £250 each per annum. Secretary: S. M. Forwood. Solicitors: Marchant, Newington & Dommett, 27, College Street, E.C.4. Registered office: 63, High Holborn, W.C.1.

Burwood (Concessionaires), Ltd. (207,398).—Private company. Registered July 21st. Capital, £1,000 in £1 shares (500 7½ per cent. cumulative preference and 500 ordinary). Objects: To carry on the business of importers, exporters and manufacturers of and dealers in electrical machinery, wireless receiving and transmitting apparatus, accessories and parts, automobile lamps, kinematograph goods, &c. The permanent directors are:—J. H. Wood, 20, Lesbia Road, Clapton, secretary; L. R. Wood, 20, Lesbia Road, Clapton, electrical engineer; G. Davis, 16, Lamb Lane, Hackney, telegraph engineer. Remuneration of first directors, £50 each per annum. Solicitors: Foster, Grove & Jay, 35, Finsbury Square, E.C.2.

Continental Radio Import Co., Ltd. (207,450).—Private company. Registered July 23rd. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers, importers and exporters of, agents for and dealers in electrical and other instruments, appliances, supplies and components in connection with wireless telegraphy and telephony, and wireless communications, scientific instruments, &c. The first directors are:—S. Kremner, 377, Cheetham Hill Road, Manchester, merchant; I. Kremner, 3, Oakfield Street, Cheetham Hill, Manchester, merchant. Qualification, £10. Solicitors: Neville Isitt & Co., 26, Brazennose Street, Manchester. Registered office: 26, Brazennose Street, Manchester.

Alfred Roberts & Sons (1925), Ltd. (207,449). — Private company. Registered July 23rd. Capital, £25,000 in £1 shares. Objects: To acquire the business of Alfred Roberts & Sons, Ltd., incorporated in 1921, now in liquidation, and to carry on the business of manufacturers, producers and sellers of rubber and rubber goods of all kinds, and all goods, compounds and materials in the manufacture or preparation of which rubber, countchouc gum, gutta-percha, xylonite, vulcanite, stabilite, celluloid, asbestos, fibre, paper, leather or textile materials or other like substances may be used, &c. The subscribers (each with one share) are:—R. S. T. Shelly, Aston Brook Street, Birmingham, engineer; T. W. Horton, 4, Bennetts Hill, Birmingham, solicitor. The first directors are:—R. S. T. Shelley (chairman), W. Mansell and E. Lawrence, addresses not stated. Qualification: 500 shares. Solicitors: Wragge & Co. 4, Bennetts Hill, Birmingham.

Sunlight and Electric-Therapeutic Nature Treatment, Ltd. (207,352).—Private company. Registered July 18th as a company limited by guarantee and not having a capital divided into shares, with 20 members each liable for 1s. in the event of winding up. Objects: To act as an institute for electrical operations and practices, comprising and utilising any type of sunlight radiation for medical-therapeutic purposes, whether carbon arc lamps, mercury-vapour, green, blue, and ultra-violet or other rays, &c. The first directors are:—G. A. O. Hanlon, 18, Adam Street, Adelphi, W.C., director of Securities Finance Corporation, Ltd.; Hilda M. Simmons, 72, Woodlands Avenue, Wanstead, technical therapeutist. Secretary: Hilda M. Simmons.

Shirebrook Electric Supply Co., Ltd. (207,358).—Private company. Registered July 18th. Capital, £5,000 in £1 shares. Objects: To carry on at Shirebrook and elsewhere the business of an electric lighting and supply company. The directors are:—M. Robinson, 158, Station Road, Shirebrook; A. Riley, 18, Main Street, Shirebrook; G. Barker, 166, Station Road, Shirebrook; G. M. Webster, Market Hotel, Shirebrook; G. H. Oade, 6, Market Square, Shirebrook. Qualification, 100 shares. Secretary: E. Edson. Solicitor: J. J. B. Young, 25, Bank Street, Sheffield. Registered office: Church Drive, Shirebrook.

J. F. Rispin, Ltd. (207,349).—Private company. Registered July 18th. Capital, £500 in £1 shares. Objects: To acquire the business of a motor and electrical engineer carried on by J. F. Riskin at Well Lane, Batley, as "J. F. Riscin & Co." The subscribers (each with one share) are:—J. F. Rispin, 7, Grove Place, Leeds, electrical and motor engineer; Mrs. L. A. Rispin, 7, Grove Place, Leeds. J. F. Rispin is the first director. Qualification, 100 shares. Solicitors: Watts & Son, Dewsbury. Registered office: Well Lane, Batley.

Cecil Cooper & Co. (London), Ltd. (207,343).—Private company. Registered July 18th. Capital, £12,000 in £1 shares. Objects: To adopt an agreement with Cecil Cooper & Co., Ltd., for the acquisition of the London branch of their business and to carry on the business of electricians, mechanical engineers, manufacturers, and workers of and dealers in electricity, motive power and light, &c. The subscribers (each with one share) are:—W. H. Tyrrell, 147, Oakwood Court, Kensington, W., chartered accountant; J. P. Southwell, 38, The Ridgeway, Golder's Green, N.W., chartered accountant. C. J. Cooper is one of the first directors, and may retain office for life. Solicitor: W. B. Wattson, 31, Budge Row, E.C.4. Registered office: 14, Gloucester Road, Kensington, S.W.7.

Official Returns of Electrical Companies.

Thermal Electric Works (Hackbridge), Ltd.—Debenture dated July 10th, 1925, to secure £500 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: A. Keene, 5, Barmouth Road, Wandsworth Common, S.W.

Berrite, Ltd.—Satisfaction in full on March 12th, 1925, of mortgage dated July 21st, 1924, securing £2,700 and further advances. (Notice filed July 17th.)

Orlings Telegraph Instrument Syndicate, Ltd.—Issue on July 13th, 1925, of £25 debentures, part of a series already registered.

Atkinson, Lloyd & Co., Ltd.—N. Wood, of 26, Corporation Street, Manchester, ceased to act as receiver or manager on June 2nd, 1925.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Greenwood and Batley, Ltd.

The annual meeting of this company was held on July 22nd, Col. O. C. Armstrong, D.S.O. (chairman), presiding. Col. Armstrong, in moving the adoption of the report and accounts (see ELEC. REV., July 17th, p. 109) referred to the depressed state of industry generally and the general engineering industry particularly. He considered that while the unsettled state of Europe and the inflated currency of Continental countries was responsible for a great deal of this there were other factors. Although there had been an improvement in conditions on the Continent, the expected reaction upon our export trade had not materialised. In fact, things had become worse and our unemployment figures were higher. One of the most serious causes of the trouble was the attitude adopted by certain sections of labour. They did not seem to gauge the gravity of the situation. They did not realise that no industry or occupation stood by itself; the cost of coal, railway rates, public utility services, freights, dock charges, &c., all acted and reacted upon the cost of production. The short-sighted view prevailed that each section was a law unto itself. If the men would neither accept a lower wage nor work harder for longer hours, there could only be one outcome—the gradual attrition of many of our industries and the handing over of a large proportion of our foreign trade to our competitors. The chairman also referred to the burden of taxation, and said that he would place little confidence in the committee which was being set up to consider the matter unless its terms of reference included the condition of a fixed minimum of reduction, leaving only the excess to their determination. Turning to the accounts, the chairman said that in spite of the bad times the company was in a strong financial position. The reserves and the surplus of the profit and loss account totalled over £200,000, representing 57 per cent. of the paid-up ordinary share capital. The valuation of the works was £398,918—a low figure. The shareholders could congratulate themselves upon the company's satisfactory position. It was difficult to forecast the results of the current year. Although the orders for the first quarter were less than in the first quarter of last year, a number of good inquiries had been received. The works had been maintained in a high state of efficiency and were prepared to cope with any orders which might be received.

Marconi International Marine Communication Co., Ltd.

Senatore G. Marconi (chairman) presided at the annual meeting of the company on July 24th, and in dealing with the report and accounts (*vide* our last issue, p. 149), he said that the total revenue was slightly in excess of that of the preceding year. The net profit included £26,000 from investments, so that the profit from the company's business operations was about £57,000. This compared unfavourably with the profits of previous years, but in view of the unprecedented depression in the shipping industry the result was not unsatisfactory; the company could only prosper when shipping was prosperous. The company was in a very strong financial position, holding more than £550,000 of gilt-edged securities in addition to substantial bank deposits. For each of the company's £1 shares 10s. was invested in securities earning not less than 5 per cent. The chairman mentioned that the company had recently completed 25 years of service and he reviewed some of the work which had been done. He said that although allowance had been made for depreciation in the ordinary sense, the rapid development of radio-telegraphy demanded something more than that if an efficient service was to be maintained. Since 1920 the company had spent £100,000 in keeping up to date stations on hire to shipowners. Maintenance charges had increased considerably, too, and it might be necessary for some years to come to spend £20,000 annually on modernisation. The company had adopted the policy of allowing a reduction of rental to shipowners when their vessels were laid up; since 1921 £27,277 had been granted in this way. Referring to the experiments in radio-telephony between ships and between ships and the shore, Senatore Marconi said that the results demonstrated that there was no technical difficulty in the way of instituting a satisfactory service of duplex radio-telephony, especially between ships on the high seas, away from the areas of congested radio-telegraphic traffic. The company was quite ready to exploit the possibilities of this system as soon as a demand arose for it, but it would merely act as an adjunct to and would not supersede radio-telegraphy. The demand for the company's direction finder had rapidly increased. The company did not think it desirable for the Government to enforce the new regulation compelling the installation of an automatic calling device on vessels carrying a crew of fewer than 50. The chairman said that in efficiency and organisation the company was unrivalled. He would not prophesy as to the future; they could only hope that the depression in industry would soon pass away. In conclusion, he referred to the death of Mr. Godfrey Isaacs and Mr. W. W. Bradfield, and he mentioned the appointment to the board of Mr. Henry Morgan and Sir Bertram Hayes, and that of Mr. F. S. Hayburn as general manager. The report and accounts were adopted after a brief address by Mr. F. G. Kellaway, the deputy chairman and managing director.

Chili Telephone Co., Ltd.

In presenting the report and accounts (*vide* ELEC. REV., July 10th, p. 68) at the recent annual meeting, the chairman (Mr. Eric B. Butler-Henderson) said that the company's business had steadily advanced in spite of the political changes which had taken place in Chile, and had tended to arrest general commercial progress. The basic tariffs under the new concession had proved unsatisfactory. Under this concession the company had to provide automatic plant at Santiago and carry out extensive improvements at Antofagasta, Concepcion, Iquique, Vina del Mar, and other districts, in addition to new trunk-line communication between Santiago and Valparaiso and at various other places. A large amount of this work had been carried out; the new plant at Santiago was in course of manufacture by Messrs. Siemens Bros. & Co., Ltd., a capacious concrete building was being erected, and it was hoped to have the plant installed in January or February next. The technical staff was engaged in constructing the new trunk lines from Santiago to Valparaiso. At Concepcion underground work was being pushed forward, and a modern c.b. switchboard plant for this centre was being made by Messrs. Ericsson at Stockholm. At Antofagasta similar work was being done and a c.b. switchboard plant, also made by Messrs. Ericsson, had already arrived there. An extension to the Valparaiso automatic plant, made by Messrs. Siemens Bros., had been installed, and a special composite cable had been laid from Valparaiso to Vina del Mar. This work had necessitated new capital and that was the reason for the issue of £156,000 of shares during the year. Negotiations were proceeding with the authorities for permission to institute a more remunerative tariff and he (the chairman) had every confidence that satisfactory arrangements would be made. In briefly reviewing the accounts, the chairman pointed out that the revenue had been very slightly affected, although the net profit was lower by about £8,000. In view of the developments the directors considered it necessary to transfer £10,500 to the reserve for plant renewal, which involved a reduction in the final dividend.

Victoria Falls and Transvaal Power Co., Ltd.

The annual meeting was held on July 23rd, the Marquess of Winchester in the chair. In moving the adoption of the report (ELEC. REV., July 17th, p. 108), the chairman said that the profit and loss account for the year after providing for the service of the debentures, depreciation, and taxation, showed a net profit of £349,852. The maximum dividend of 10 per cent. had again been paid on the preference shares and 12½ per cent. on the ordinary shares, compared with 10 per cent. for 1923. £50,000 had again been added to reserve, which now stood at £350,000. He was pleased to report that the company's business and prospects continued to be quite satisfactory. The plant capacity had been fully loaded as in the previous year, and further demands for power had been notified. The present supply was being well maintained, though the further demands for power by the mining industry had caused some anxiety as regarded the margin of spare plant. That position would be entirely relieved when the Witbank station which was being built by the company for the Electricity Supply Commission, came fully into commercial service. At that time also the final adjustment of prices arranged in the new power contracts of the further discount of 2½ per cent. would come into force. The erection of the first section was due to be finished by the end of the current year. Meanwhile they had also sent out an additional 12,500-kW turbo-alternator for erection at Rosherville. That machine would be available for service within the next few months, and would not only secure the stability of their supply at the moment but also be a most valuable and useful permanent addition to their plant. Their arrangements under the new agreements with the Electricity Supply Commission and with the mining groups were working quite satisfactorily and harmoniously, and he looked forward to a period of steady business free from the difficulties which were previously always with them through the uncertainty of the interpretation of contracts. At previous meetings he had referred to their lease of the power at the Victoria Falls which asset up to the present they had never been able to turn to account. The cause of that was that there was no market for power in that part of Africa. Nevertheless, they had the matter always before them and would welcome the time when the population of Rhodesia and its industries would require sufficient power to justify the development of the Falls.

Marconi's Wireless Telegraph Co.

The report for the past year states that although large sums were devoted in the last accounts to the writing-down of assets, it has become necessary to allocate still further sums to this process. The sum of £75,140 has been credited to the general reserve, being the company's share of the amount of £127,609 received from the Post Office in respect of war services; the balance has been paid to the subsidiary company operating the Carnarvon station. First convertible debenture stock has been purchased in the market to the extent of £70,595 and the cost in excess of par value has been deducted from the general reserve. On the other hand, this reserve had been credited with the premium obtained from the issue of 500,000 new ordinary shares. The net profit for the year, after providing for debenture interest, was £225,600—an increase of £53,056. The addition of the balance brought forward makes available £628,159. It is proposed to pay a final dividend of 5 per cent. on the ordinary shares (making 10 per cent. for the year) and to carry forward a balance of £310,652. The beam stations for communication with the Dominions and India are being built for operation by the Government. The company is to receive a royalty of 6¼ per cent. on the gross radio receipts of these services. The "beam" system is developing satisfactorily. Recent experiments showed that communication with Canada and Australia could be maintained throughout the whole day, and the results with India and South Africa have removed all doubts as to the company's ability to fulfil its guarantees. The short-wave system is considered to be the future method of dealing with commercial messages. An arbitrator has been appointed in connection with the company's claim against the Government for the use of its patents by the Services during the war, and every effort is being made to expedite the preliminary work. The meeting is to be held to-day (Friday).

Petters, Ltd.

Speaking at the company's annual meeting on July 23rd, the chairman (Sir E. W. Petter) said that the accounts for the past year showed a distinct improvement, but they were still suffering from periods of slackness which ate into the profits earned during the busy times. The directors proposed to fund the arrears of dividend on the preference shares amounting to £45,000 and it was hoped to pay off the arrears in a shorter time than that provided for under the scheme. He attributed the unrest in the engineering industry to the effect of the high rates paid to those employed in sheltered industries. It was impossible to increase the wages of skilled men, although, relatively, an increase was justifiable. The scheme for funding the arrears of preference dividend was approved at a subsequent extraordinary meeting.

French Company.—The *Société Française Radio Electrique*, which made a net profit last year of 2,108,722 fr., reports that not only were the works fully occupied on radio-telegraphic material for the Government and private undertakings, but the "Radiola" department had had a busy year in meeting the demand for broadcast receiving sets and components. Some further extensions are being carried out at the works at Levallois-Perret.

Belgian Companies.—The report for last year of the *Société d'Electricité du Bassin de Charleroi* shows a net profit of 2,802,608 fr., as compared with 2,220,831 fr. in 1923.

The *Société d'Electricité du Nord de la Belgique* reports a profit of 4,738,400 fr. as against 3,739,485 fr. in the preceding year.

Czecho-Slovakian Company.—The *North Bohemian Electricity Works Co.*, Podmokly (Bodenbach), has paid a dividend of 10 per cent. for last year, as in 1923.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159, and the Committee has ordered them to be officially quoted:—

Calcutta Electric Supply Corporation, Ltd.—191,116 new ordinary shares of £1 each, fully paid, Nos. 1,025,462 to 1,216,577.

Tottenham District Light, Heat, and Power Co.—The full dividends on the 5 and 5½ per cent. preference shares have been paid in respect of the half year to June 30th last. The "A" stock receives a dividend at the rate of 7⅞ per cent. per annum (as against 8 per cent. in 1924), and the "B" stock one at the rate of 5⅞ per cent. per annum (as against 6¼ per cent.).

Argentine Light and Power Co., Ltd.—The directors state that owing to the delay in completing the audit of the accounts of the subsidiary companies for their incorporation in the company's accounts, the annual meeting will not be held until the early autumn. It is stated that the accounts show a steady improvement in the revenue position.

London Electric Supply Corporation, Ltd.—An interim dividend of 3s. per share, being at the rate of 6 per cent. per annum, for the six months ended June 30th, has been declared on the preference shares, and a dividend of 9.6d. per ordinary share, being at the rate of 8 per cent. per annum, has been declared for the same period.

Kalgoorlie Electric Tramways, Ltd.—The report for 1924 shows gross receipts of £26,079 and a net profit of £5,148—a reduction of £2,297, which is attributed to the depressed state of business and motor-omnibus competition. The number of passengers carried decreased from 1,927,398 to 1,729,414. The meeting was to be held yesterday (Thursday).

Puebla Tramway, Light and Power Co.—The net profits of this company in Mexico for 1924 amounted to $1,272,584 (Mex.), equivalent to £129,909. After paying all expenses, including mortgage interest, note service interest, and sinking fund contributions, a balance of £1,682 is carried forward.

Vickers, Ltd.—Dividends of 2½ per cent., less tax, have been declared for the half-year ended June 30th, on the 5 per cent. preferred stock and the 5 per cent. preference shares. The cumulative preference shares receive 2½ per cent., free of tax.

Northern Mexico Power and Development Co.—The report for 1924 shows a net income of $364,842 as compared with $293,193. The proceeds of a bond issue during the year ($300,000) were applied to extensions. The dividends accrued during 1920 and 1921 on the preference shares have been paid.

Western Union Telegraph Co. (Inc.).—The earnings report for the six months ended June 30th last shows a gross revenue of $55,448,011 and a net income of $6,043,234, as compared with $59,938,214 and $6,965,937 respectively in the first half of 1924.

Kensington and Knightsbridge Electric Lighting Co., Ltd.—The directors have declared an interim dividend on account of the year ending December 31st next of 5s. per share, less tax, on the ordinary shares, payable on August 8th.

Charing Cross Electricity Supply Co., Ltd.—The directors have declared an interim dividend on the ordinary shares of the West End Undertakings for the half-year ended June 30th, at the rate of 1s. 6d. per share.

Consolidated Gas, Electric Light and Power of Baltimore.—A dividend of $0.5 per share has been declared on the common shares of no par value, for the quarter ending September 30th.

Canadian Marconi Co.—By a special Act of the Canadian Legislature the name of the Marconi Wireless Telegraph Co., of Canada, has been changed to "Canadian Marconi Company."

Northampton Electric Light and Power Co., Ltd.—The following interim dividends have been declared:—2½ per cent. on the 5 per cent. preference "B" shares, and 4 per cent. on the ordinary "B" shares.

Herbert Morris, Ltd.—A dividend at the rate of 7½ per cent. per annum has been declared on the ordinary shares for the half year to January 31st last.

Llanelly and District Electric Supply Co., Ltd.—A dividend at the rate of 6 per cent. per annum has been declared on the ordinary shares.

Metropolitan Railway Co.—An interim dividend of 2 per cent. actual, has been declared on the ordinary stock. The Surplus Lands stock is to receive 1½ per cent., actual.

Rushden and District Electric Supply Co., Ltd.—The directors have declared an interim dividend of 3½ per cent.

Mather & Platt, Ltd.—An interim dividend of 5 per cent. actual, free of tax, has been declared, as in 1924.

Metropolitan Electric Supply Co., Ltd.—An interim dividend at the rate of 6 per cent., as in 1924, is announced.

Stocks and Shares.

MONDAY EVENING.

THIS seems to be the time of year for which strikes, lock-outs and other labour disturbances show peculiar partiality. This week is one of fresh crises in the particular areas affected by mining and railway problems. The shadow of a possibly extensive strike casts depression over Stock Exchange markets. There is some little talk about the likelihood of a reduction in the Bank Rate, but this, as a Stock Exchange factor, is practically ignored, and it is improbable that any change will be made until the monetary requirements of the autumn are provided.

Business in the Stock Exchange is quiet. The rubber boom, as such, has tamed considerably, though there is still a very large volume of trade being done, in consequence of the continued strength of the price of raw rubber. The protest of the India Rubber Manufacturers' Association against retention of restriction upon rubber output remains the subject of a good deal of discussion. The standard of exportable rubber becomes raised this week to 75 per cent. of the allowance

granted to companies that conform to the Stevenson Restriction scheme, and this in itself should relieve the situation to the extent of providing, within the next few weeks, a material increase in the supplies.

Home Railway stocks are dull, owing to the fears of a lock-out in the mining districts. Metropolitan ordinary at 69½ is tolerably steady. The company has declared an interim dividend of 2 per cent., being the same rate as that of last year. Districts went back to 45, and the Undergrounds have not varied.

Interim dividends are in course of declaration by the various electricity supply companies. The Charing Cross announcement is at the rate of 1s. 6d. per share, *i.e.*, 7½ per cent., an increase of 3d. per share over the 1924 payment. No alterations are made by the London Electric Supply Corporation at 4 per cent., County of London at 5 per cent., Metropolitan and Llanelly both at 6 per cent. The Charing Cross increase comes as a pleasant surprise, for it had not been expected that any of the London companies would pay more, in their interim distributions, than they did a year ago. The price of the shares remains at 46s. 9d. London Electrics and County ordinary are both 6d. down. Westminsters drooped similarly to 45s., and Yorkshire Electrics to 29s. 6d. Edmundsons at 20s. 6d. are ex dividend. The new County preference are firm at 9d. to 1s. premium. Chiswick Electric 4½ per cent. debenture rose 2 to 86½.

Attention has been drawn for some time past to the great desirability of providing cheaper power for the encouragement of home industries. The companies that supply wide fields in the country are doing their best to reduce rates and to increase their area of supply. They operate upon lines distinct altogether from those of the West-end companies in London, and to compare, as some people are doing, the charges made by the latter companies with those of the big provincial power undertakers is to misunderstand the positions occupied by the two different classes of company.

The Marconi Wireless Telegraph Company announces a dividend making 10 per cent. for the year, whereas anticipation had prepared itself for a reduction in the rate, following upon the cut recently made in its dividend by the Marconi Marine. The parent company's net profit for the year came to £225,600, and conservative critics are inclined to think that the directors are scraping the pot a little too clean by distributing 10 per cent., having regard to the increased capital which now ranks for dividend. The report refers to heavy depreciation of foreign currencies, which, together with the possibilities of certain subsidiary companies, has rendered it necessary to make greater provision than was expected when the directors six months ago issued a circular expressing the opinion that necessary provision would not reduce the general reserve account below 1½ million pounds sterling. This reserve is now reduced to £1,047,902, sundry assets having been written down by £678,000. The price of the shares is unchanged at 1½, and Marines at 18s. 9d. show no recovery from their last week's dulness.

The Radio Corporation reported a loss in its last quarter's receipts, the net being $391,000, compared with a net profit of nearly two million dollars in the March quarter. The Radio Corporation has refused to lower its prices, and cutting by rival companies is considered to be the chief cause for the decline just reported. The gross income for that same June quarter came to $4,600,000, against 15 million dollars for the March quarter. The Common shares celebrated the occasion by rising ⅜ to 11¼, leading to mild wonder, on the part of the London market, at the New York demand which caused the advance.

Brazilian Tractions are the chief feature of strength in their group, the price rising 2 points to 61, in consequence of the steady improvement in the Brazilian rate of exchange. The company is doing well, according to its last report, and any such rise in the exchange rate makes a very substantial difference to the company's earnings. Cape Electrics at 1½ are better this week.

The Eastern group of cable companies is quiet as regards its prices. Eastern Extensions are ½ better; Globe ordinary ½ lower. United River Plate Telephones have fallen to 7½. It was announced in Parliament last week that the sum of 35 million pounds sterling is proposed to be spent, over the next three years, upon the further development of the telephone system. Automatic Telephones are 2½ and Internationals 24s. Enfield Manufacturing ordinary have risen to 3 1/16. Johnson and Phillips weakened to 39s. 6d., Electric Constructions to 30s. 6d., British Insulated to 61s. 3d. On the other hand, Siemens are a little better at 25s. Babcock & Wilcox keep steady. Coal, engineering and steel shares maintain a moderately firm front. The Stock Exchange declined to believe in the likelihood of a lock-out taking place; so, although prices became dull and depressed, they were not flat. Rubber shares reacted from the best, business dropping into more normal and jogtrot grooves after the mad excitement which culminated in the frenzy of a fortnight ago, and was sufficient, in itself, to burn out the healthy vigour of any boom.

Share List of Electrical Companies.

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price July 27, 1925.	Rise or fall.	Yield, p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	13	14	28/-	—	5 0 10
Brompton Ordinary	1	10	10	1⅞	—	5 14 3
Charing Cross Ordinary	1	14½	15	46/9	—	6 8 2
do. do. do. 4½ Pref ...	1	4½	14½	17/6	—	5 2 10
Chelsea	1	12	12	1⅞	—	6 8 0
City of London	1	15	15	45/9	—	5 11 2
do. do. 6% Pref.	1	6	6	28/-	—	5 4 4
Clyde Valley	1	8	8	31/-	—	5 3 3
County of London	1	15	15	52/6	—6d.	5 14 3
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	7	7	20/6xd	—	6 16 7
do. 7% Pref.	1	6	7	21/6	—6d.	6 10 3
Elec. Supply Corporation ...	1	10	10	33/3	—	6 0 4
Kensington Ordinary	5	14	15	12½	—	5 17 8
Lancs. Light and Power	1	7½	7½	25/6	—	5 17 8
London Electric	1	10	10	38/6	—6d.	5 19 5
do. do. 6% Pref	5	6	6	5⅞	—	5 7 10
Metropolitan	1	10	11	39/3	—	5 15 9
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	23/3	—	5 4 4
Newcastle-on-Tyne Ordinary ...	1	6	7	22/6	—	6 4 5
do. 5% Pref.	1	5	5	18/3	—	5 9 7
do. 7% Pref.	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	10	—	6 0 0
North Met. Elec. 6% Pref. ...	1	6	6	22 -	—	5 9 1
St. James' and Pall Mall	5	17½	17½	138xd	—	6 11 10
South London	1	15	15	2⅞	—	6 3 1
South Metropolitan Pref. ...	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	17/-	—	4 14 2
do. 6% Pref.	1	6	6	20/-	—	6 0 0
Westminster Ordinary	1	15	15	45/-	—6d.	6 13 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	19/6	—	7 13 10
Yorkshire Elec.	1	8	8	29/6	—6d.	5 8 6
HOME RAILS.						
Central London Ord. Assented Stock	4	4		68	—	5 17 8
Metropolitan	,,	4	5	69½	—	7 3 11
do. District	,,	3½	3½	45xd	—	7 15 7
Underground Electric Ordinary	10	Nil	Nil	2⅜	—	Nil
do. do. "A" ...	1 -	Nil	Nil	7/-	—	Nil
do. do. Income	Bonds	6	6	98	—	6 2 5
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	102½xd	—	5 17 1
do. Def.	,,	1½	1½	24	—	6 5 0
Automatic Telephone	1	3	6	2⅛	—	2 18 2
Chili Telephone	5	6	5	5⅞xd	—	4 13 0
Cuba Sub. Ord.	10	5	5	6⅞	—	7 8 2
Eastern Extension	10	10	10	17⅛	+ ⅛	5 16 9
Eastern Tel. Ord.	Stock	10	10	172½	—	5 15 11
Globe Tel. and T. Ord.	10	10	10	17⅜	— ½	5 15 1
do. do. Pref.	10	6	6	10⅞	—	5 10 4
Great Northern Tel.	10	22	22	31	—	7 1 11
Indo-European	25	7	8½	41½	—	4 4
Marconi	1	10	10	1⅜	—	7 5 6
Marconi Marine	1	10	7½	18/9	—	8 0 0
Oriental Telephone Ord. ...	1	12	12	2½	—	5 12 11
United R. Plate Tel.	5	8	8	7⅛	—	5 12 4
Western Telegraph	10	10	10	16½	—	6 3 1
HOME AND FOREIGN TRAMS, &c.						
Anglo-Arg. Trams First Pref. ...	5	5½	5½	5⅛	—	8 16 0
do. do. 2nd Pref. ...	5	6	6	2½	—	10 4 4
do. do. 5% Deb. ...	Stock	5	7	71½	—	6 15 2
British Electric Traction Ord. ...	,,	6	6	112	—	5 7 2
do. do. 6% Pref. ...	,,	6	6	104	—	5 15 5
Brazil Traction	100	4	4	61	+ 2	6 11 2
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	80½	—	5 11 9
do. do. Preferred	,,	96/-	96/-	80½	—	5 15 0
do. do. Deferred	,,	129/5	129/5	102	—	6 7 0
do. do. Deb.	,,	4½	4½	76½	—	5 11 1
Lond. & Sub. Trac. 5% Pref. ...	1	2½	N 1	4/6	—	Nil
London United Tram. Deb. ...	Stock	4	4	42½	—	9 8 4
Mexico Trams, 5% Bonds ...	—	5	5	62½	—	8 0 0
Mexican Light Common ...	100	Nil	Nil	25	—	Nil
do. Pref. ...	100	Nil	Nil	58	—1	Nil
do. 1st Bonds ...	—	5	5	63½	—1	7 17 6
Yorkshire (West Riding) ...	1	5	—	17,6xd	—	5 14 1
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	12	12	2⅞	—	8 18 6
British Aluminium Ord.	1	5	10	1½	—	6 13 4
British Elec. Transformer Pref.	1	Nil	7	17/6	—	... ...
British Insulated Ord.	1	15	15	3½	—	4 18 0
Brush Ord.	1	10	10	1	—	10 0 0
Callenders	1	15	15	2⅜	—	7 4 4
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	½	Nil	Nil	⅜	—	...
Edison-Swan	4/-	10	10	8/-	—	5 0 0
do. 5% Deb.	Stock	5	5	80½	—	6 4 3
Electric Construction	1	10	10	30/6	—9d.	6 11 2
Enfield Cable, Pref.	1	7½	7½	1½	—	6 0 0
English Electric	1	5	5	17,9	—6d.	5 14 8
do. do. Pref.	1	6	6	20/6	—	5 17 1
Gen. Elec. Pref.	1	6½	6½	23/6	—1	5 10 8
do. Ord.	1	6	7½	24/-	—	6 5 0
Henley	1	15	16	2½	—	5 8 11
do. 4½% Pref.	5	4½	4½	4¾	—	5 6 0
India-Rubber	1	5	6	1	—	5 0 0
Johnson & Phillips	1	10	17	39/6	—1/9	5 1 1
Met Vickers, Ord.	1	8	9	30/9	—	5 14 3
do. Pref.	2	8	8	2⅜	—	6 14 9
Siemens Ord.	1	—	7½	25/-	+6d.	6 0 0
Telegraph Construction	13	21	20	26½	—	4 10 0

* Dividends paid free of Income Tax.

The First International Congress of Radiology.

(*Continued from page* 112.)

Light Sources Used in Actinotherapy.

Mr. T. THORNE BAKER contributed a paper on "The Analysis and Comparison of Light Sources used in Actinotherapy" before Section II (Electrotherapy and Actinotherapy) on July 2nd. He pointed out that the recent extension of the work done in actinotherapy had resulted in the use of a large number of different illuminants. Artificial sunlight, so-called, was being administered in some cases, ultra-violet light in others, and the time seemed to have arrived when some attempt at standardisation of these light sources should be made, as some of them were being used a little indiscriminately. Arc lamps were used with plain carbons and with carbons cored with various chemical substances; tungsten pencils, and pencils of aluminium and other metals had been employed; the electric oscillatory spark had been similarly used, as well as the quartz mercury vapour lamp and other types. These different light sources varied enormously in spectral composition and in their relative intensities in different regions of the spectrum, and the purpose of the paper was to give some very general ideas of their comparative energy distribution as determined by the use of a large Hilger quartz spectrograph.

The pure carbon arc had been shown to approach most nearly the colour temperature of sunlight, and, owing to the comparative continuity of the spectrum of the light from the positive crater, this source might be regarded as the best approach to sunlight as a primary standard. The carbon arc also most closely approached the spectral distribution of sunlight. The following table showed a comparison between the colour temperatures of various light sources and sunlight:—

Source.	Colour temperature, degrees absolute.	
Tungsten lamp	2,360 deg. K.	
Gasfilled lamp	2,950 ,, ,,	
Carbon arc	3,700 ,, ,,	Approx.
Noon sunlight	5,000 ,, ,,	

Spectrograms of various illuminants were shown, and the results of the author's investigations showed that, for all kinds of sunlight treatment, the metallic or cored carbon arc lamps did not simulate sunlight anything like so accurately as the positive crater of the plain carbon arc or as the gasfilled metal-filament lamp; that metal arcs, or metallic-cored carbon arcs, contained a high proportion of ultra-violet light which was not present in the solar spectrum as measured through the atmosphere at any known altitude, but that they did contain a considerable proportion of irritant short rays; and that, if these harmful rays were filtered out by boro-silicate glass, such arcs could be made to simulate sunlight far more closely.

Finally, it seemed to be urgently necessary to carry out far more extensive investigations as to the energy distribution in the spectra of the various illuminants using the photo-electric cell and not merely the photographic plate, with its limited capabilities, as at present many actinotherapists were working almost as much in the dark as were radiologists in the early days of X-rays. The author said that Mr. W. A. Balwain and himself were engaged in estimating the spectral intensity of the various therapy lamps for each 100 wave-lengths of the ultra-violet spectrum by means of photo-electric cells. This work would take some months, but it was hoped to communicate the results to the Institute of Radiology.

The Industrial Uses of X-rays.

Before the Physics Section on July 2nd, Mr. C. Norman Kemp, of Edinburgh, read two short notes: (*a*) "The Applications of X-rays in the Technology of Coal" and (*b*) "X-rays in Industry, with Special Reference to Technical Radiology." Both the communications were in general terms.

With regard to the former subject, Mr. Kemp said it had been shown in this way that coal contained two distinct types of ash, one which was associated with the coal substance proper and could not by any process be removed from it, namely, the portion which under the stereoscope gave a more or less uniform field, and the other, the free ash, which showed up as blackish banding and could be removed from the coal by suitable treatment. This was of more interest than appeared at first sight, because it facilitated removal of the ash and non-burnable material from the really useful portion of the coal that was mined. Thus there was an important field for the examination of coal by means of X-rays before it was put on the market.

In his second communication Mr. Kemp emphasised the importance of introducing technical radiology as a distinct science and for providing facilities for teaching it. Generally speaking, at our universities and colleges there was a small radiological laboratory in which some extremely useful work was carried out but otherwise, in the main electrical engineering departments of the large technical institutions in this country the matter never seemed to have received any consideration at all until three years ago, when he was asked to give a course at the Royal Technical College, Glasgow; that work had since been continued, and had aroused a considerable amount of interest. In this country the utilisation of X-rays by industrial firms seemed to be rather behind that in others, notably France and the United States. If training in X-ray technology became a normal course for electrical engineers, they would at least be provided with knowledge which they could turn to account when the occasion arose.

Dr. V. E. PULLIN (Director of Radiological Research, Woolwich Arsenal) said the value of radiology to industry was a subject he had been trying to push for a great many years. There must be numerous undiscovered ways in which X-rays could be employed in industry. At the same time, as the result of very large experience, he felt that X-ray equipment at the present time was not in the state it might be in to enable them to obtain definite decisions upon industrial problems. There was also the danger of people being over-ambitious, and failure to do the impossible might react upon the science and result in its being condemned unjustly by prospective users. As an instance of the value of X-rays in solving practical problems, he mentioned the serious railway accident in the North of England last year, when the tire of a wheel gave way, and X-ray examination of it showed at once the nature of the fault which had led to this unfortunate accident. That involved the penetration of 4 in. of steel, which appeared to be the maximum possible at the moment. One of the most important pieces of apparatus, industrially, was the X-ray spectroscope, which had been used so much to study various materials. He felt very strongly that it was to the development of that instrument that industry must look for its more immediate benefits.

Mr. J. R. CLARKE (Sheffield) expressed some doubt as to whether X-ray technology could be included as part of the curriculum of engineering education, except at the expense of some other item.

Dr. H. MOORE (London) said that, although there were certain definite ways in which X-rays could be used for industrial purposes, there were difficulties; unless a flaw in steel, for instance, happened to be at right angles to the direction of the beam, it might not be observed as a flaw on the X-ray plate.

Dr. E. A. OWEN (National Physical Laboratory) said that, although they were doing a great deal of an industrial nature with X-rays at the N.P.L., he had never been able to obtain positive results. It was not at present possible to say that if a flaw was not discovered by X-ray examination, there was no flaw present.

Producing Current at Constant High Pressure.

An interesting discussion on this subject took place before the Physics Section on Friday, July 3rd.

Mr. C. E. S. PHILLIPS said that the introduction of any apparatus or device which would increase the precision with which the radiation dose could be administered, must be regarded as a step forward. For this reason, the introduction of apparatus for the production of current at constant high voltage was of very great importance. Work was being carried out with this end in view in all countries, and greater efficiency must follow the use of such apparatus. One of the chief difficulties in the construction of apparatus of this type was the avoidance of corona in the condenser, and it was desirable to know how to make a condenser which would be of reasonable dimensions for the required capacity, possibly of the order of 0.02 mfd, to withstand 200,000 volts or more at the terminals, the design to give accessibility for removing the large amount of soot and dust from the air which very quickly settled upon highly electrified apparatus in large cities. Special arrangements had been made in this connection in several of the types of constant high-pressure apparatus which were on the market, such, for instance, as that of the Radiological and Surgical Co. in this country and Messrs. Gaiffe & Gallot of Paris.

Radiation from a Coolidge tube with such an apparatus was richer in short-wave lengths than those produced under analogous conditions by means of a transformer. There was, too, an important constructional advantage in being able to get a potential across the tube which was double that across the transformer. Other points in favour of the system were the steadiness of the meter reading and greater reliability in the reproduction of any set of conditions. Further, it was claimed that the time taken for an exposure could be considerably reduced, but the outfit did not give a homogeneous beam, due to obstructions and other irregularities at the target. Although the Wimshurst influence machine had definitely been proved to give a constant current at high pressure when connected to a non-inductive resistance, it failed to do so when a Coolidge tube was introduced into the circuit.

Prof. F. DESSAUER (Frankfort) gave an account of some experiments carried out during the past three years at the Frankfort University upon new systems for the production of current at constant high pressure. The result of this work had been the evolution of a system in which single storage battery cells could be connected in series or parallel at will. The apparatus described consisted of individual units capable of giving 25,000 volts, a series of these units being connected together to give a higher voltage. A circuit was shown of nine units connected together, the current being 30 milliamperes at 225,000 volts. Each unit consisted of the battery, transformer, and a kenotron, and was complete in itself, having only to be connected to others.

Dr. H. MOORE (London) said the main advantage to be gained by the use of X-ray generators of constant voltage was that it allowed comparisons of results to be made in a much more accurate manner than was now the case. Another point was that if the current was being sent across the X-ray tube at a certain definite voltage, one could be certain of getting the most efficient working with the tube for the particular voltage in use, and one got a more nearly homogeneous beam of X-rays than with a transformer set or a coil set. Practically all constant-voltage sets—with the exception of two with which he had worked—had kenotron valves as rectifiers, and they also worked on single-phase current. When one put single-phase current through a kenotron valve and tried to smooth it out to get constant potential with a fluctuation, say, of not more than 5 or 10 per cent., it was necessary to use quite big smoothing condensers unless the frequency happened to be fairly high and it was difficult to design condensers to do that work satisfactorily.

Dr. G. FAILLA (New York) said he had heard that tubes did not last as long with constant-pressure apparatus as with transformer apparatus. Moreover, American experience showed that with the higher frequencies the insulators did not last so long as with the lower frequencies.

Prof. DESSAUER said that he had found that tubes lasted very much longer with his system of constant potential, and that the kenotrons lasted 700 hours.

Dr. F. L. HOPWOOD (St. Bartholomew's Hospital, London) said that one of the most important aspects was the reduction in time of operation. At the present time one treatment lasted several hours, and it was hoped at St. Bartholomew's Hospital to change over to the constant-pressure system and to be able to diminish the time of treatment by something between 20 and 50 per cent. If that could be done, as he believed it could, it would diminish the sufferings of the patients tremendously.

Dr. FAILLA said that the use of water-cooled tubes resulted in very much shorter exposures being necessary. In several installations in the United States the treatment was now complete in from five to seven minutes.

Dr. DESSAUER said the condensers in the system he had described were used in series as he had mentioned, and they gave an absolutely equal distribution with alternating current, which was very important.

The CHAIRMAN, in winding up the discussion, said that they could look upon the work of the Physics Section with considerable satisfaction, because it had made a recommendation with regard to an International Committee on measurement and standardisation, and had also proposed to take steps concerning methods of protection. High-pressure current at constant voltage was the thing of the future, and they should try to impress that fact upon their medical colleagues.

An International Committee.

On July 4th, there was a meeting of delegates at which an International Committee was formed, it having been decided at the preliminary meeting of delegates on July 1st to constitute the Congress a triennial one to be held in different countries.

A New Medical Carbon Arc Lamp.

Dr. A. STEIN (Wiesbaden) before Section II (Electrotherapy and Actinotherapy) on July 2nd gave a description of a new type of medical carbon-arc lamp. He stated that following the work of Finsen and the treatment of disease by means of ultra-violet rays, it had been thought that these were the only active therapeutic agents in heliotherapy and that therefore the lamp that emitted no other rays must be therapeutically the best. Careful experiments and observations by a large number of modern practitioners, however, had led to the conclusion that not only the ultra-violet rays, but also some others, particularly the infra-red, were most effective as therapeutic agents.

Starting on these premises, therefore, Dr. Stein said that he set to work to find new sources of artificial sunlight which would resemble natural sunlight to the greatest degree. In his opinion the light produced by the passage of an electric current between two carbon points was far more similar to natural sunlight than that produced by quartz lamps; it was, he said, scarcely possible to produce a light that was less like natural sunlight than that of the mercury vapour quartz lamp. Taking, therefore, the carbon arc lamp for this purpose, the author set himself the two problems (1) of so arranging the lamp that the rays emitted by it should resemble as nearly as possible, in their spectral composition, those of the sun, and (2) of rendering the greatest possible percentage of the total energy set free by the arc between carbon points available for heliotherapeutic needs. So far as the first proposition was concerned, this had already been accomplished experimentally by mixing certain metallic salts in the points of the carbons. In this way it had been found possible to approach natural sunlight to a remarkable degree, although to repeat natural sunlight in every particular seemed almost impossible. In the lamp which he described, however, he claimed to have been successful in imitating natural sunlight to as great an extent as present-day knowledge permitted. The second proposition had been met satisfactorily by placing the two carbon points in parallel, a method never yet adopted for such radiations in heliotherapy; the idea of placing two carbons in parallel, of course, was not new, this method having been adopted as long ago as 1876 in the Jablochkoff candle.

Although this new lamp, which had been named the "Jupiter" lamp, was extraordinarily rich in ultra-violet rays, its principal efficiency lay in the infra-red portion of the spectrum. It was not disputed that the ultra-violet rays set up an inflammation of the skin, but the great advantage claimed for the Jupiter lamp was that this could be avoided. One form of lamp was shown in which there were two pairs of parallel carbons, and thus a double arc. Both the pairs of carbons were placed inside a hemispherical aluminium reflector, which could be left open in front when general radiation was required, or partly closed with a funnel-shaped adapter for small local radiations. This lamp worked at 10 amperes and gave 6,000 c.p. The resistance necessary for the satisfactory working of the lamp was in a small case fitted at the back of the reflector. The lamp was so arranged, also, that it was adaptable for 110, 120, or 220 volts, a.c. or d.c. Other models of the lamp were demonstrated. A curious feature was that the gases emitted by these arc lamps had a certain therapeutic value, especially in cases of high blood pressure. No regulation of the carbons was necessary during burning, and there was an automatic arrangement which extinguished the lamp when the carbons had almost burned out, in order to avoid damaging the metal parts. The lamps were said to have been tried by a large number of German physicians with great success.

A New X-ray Tube.

A new metal X-ray tube for radiography and therapeutics was described to the Physics Section on July 2nd by Dr. A. Bouwers, physicist at the Philips Lamp Works in Holland. The metal wall of the tube consists of a chromium-iron alloy capable of being readily sealed to the glass and retaining a perfect vacuum. The heat conductance of this metal is so very small that it can be made red-hot at one end without injuring the seal at the other end. An incandescent kathode filament is placed within the metal vessel which has a circular opening, at a very short distance from which an insulated electrode is mounted, serving as an antikathode. The electrons are drawn towards the antikathode through this opening. Thus a sharply-focused spot is produced, the diameter of which depends upon the size of the opening, which serves as an electron diaphragm. The X-rays issue from the antikathode at right angles through a window. The rays which do not emerge from the window are absorbed by metal protective walls of lead and brass arranged round the tube inside the chromium-iron casing, hence the tube can be used without any further protective devices. It is claimed that this type of tube, in addition to the general advantage of complete protection without external aids, also has an increased output as compared with the usual X-ray tubes.

The metal-enclosed tube has been developed in several types for various purposes, and such tubes are said to have worked perfectly satisfactorily for three years.

(To be continued.)

Power Companies' Costs and Charges.—In a letter to the Editor of *The Times*, a correspondent gives some interesting figures of the production costs of and the charges made (as published by the Electricity Commission) by 20 electricity supply companies, 10 provincial and 10 London, for the year 1922-23. The figures are as follows:—

Undertaking.	Total costs including interest.	Average price obtained.	Surplus.
Provincial Companies:—	d.	d.	d.
Newcastle	0.74	0.76	0.02
Clyde Valley	0.66	1.02	0.36
Yorkshire	0.72	1.05	0.33
Lancashire	0.55	0.95	0.40
Mersey	1.08	0.79	0.29*
South Wales	1.07	1.09	0.02
North Wales	1.38	0.99	0.39*
Scottish Power ...	0.77	1.29	0.52
Fife Power	0.76	1.22	0.46
Shropshire, Worcester, and Staffordshire ...	1.12	1.49	0.37
London Companies:—			
County of London ...	1.78	3.44	1.66
City of London ...	2.43	3.95	1.52
Metropolitan	2.74	4.34	1.60
Charing Cross	2.52	4.04	1.52
St. James' & Pall Mall	2.80	4.08	1.28
Westminster	2.51	3.45	0.94
London	1.30	1.89	0.59
Brompton	3.24	5.28	2.04
Kensington	3.48	4.58	1.10
South London	1.68	3.53	1.85

* Deficit.

Czecho-Slovakian High-pressure Boilers. — Increasing attention is being devoted to the construction and use of high-pressure steam boilers in Czecho-Slovakia. The Witkowitz Mining and Ironworks Co., of Witkowitz, has recently completed a battery for a Mahrisch-Ostrau concern to work at a pressure of 40 atmospheres and at a temperature of 400 deg. Celsius, and also one for its own collieries to work at 100 atmospheres and 490-500 deg. C. The last-named boilers are arranged to be fired with coke-oven gas, but may later be adapted to use pulverised coal.

Electricity at the Royal Agricultural Show.

Practical Demonstrations of Electrical Methods of Farming.

(*Concluded from page* 129.)

THE many electrical exhibits at the Royal Show at Chester, at which an important Conference on Electro-Farming, convened and arranged by the Agricultural Sub-Committee of the British Electrical Development Association, Inc., was held under the chairmanship of Lord Bledisloe on Wednesday, July 8th, proved of wide interest. Vistas of new possibilities for the application of electricity in agriculture were opened to the uninitiated, and it will not be inopportune to generally review some of the exhibits which attracted the attention of large numbers of visitors.

Scattered among the regular lines of agricultural implements were some thirty new inventions or improvements which had been entered for the Society's silver medals. Of these the new 12-h.p. wind-power plant, complete with a 5.5-kW, d.c.

Fig. 1.—Chester Corporation Tent and Transmission Line Exhibit.

generator, and a 58-ft. tower by Messrs. Young, Osmond and Young, of London, attracted much interest. This was undoubtedly the best electrically-equipped stand. It showed a 40-kW estate and farm power plant, comprising engine, generator, switchboard and battery, in conjunction with a kibbler, churn separator, milking machine, &c. An interesting feature of this stand was an electric tractor with caterpillar tracks. The device is designed to have almost the same freedom of movement as the ordinary oil tractor; a length of cable is employed, and is paid out or wound up according to the posi-

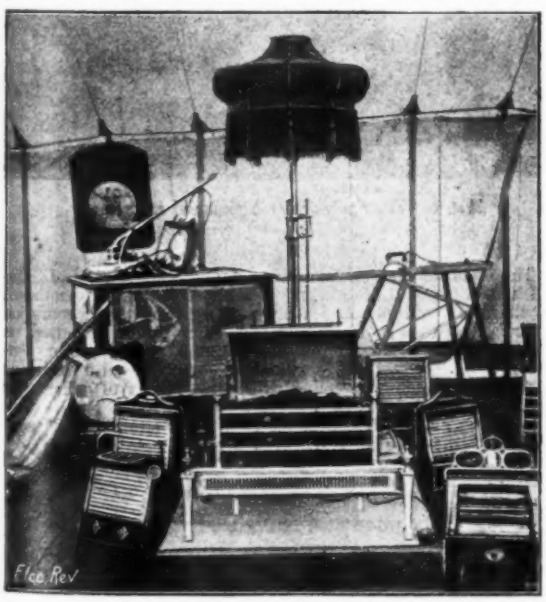


Fig. 2.—Part of the Corporation Exhibit.

tion of the tractor. This machine is to undergo practical field trials after the Royal Show. An improved electric crop dryer, in which the air is heated by means of self-contained electrical elements and blown into the stacks by means of an electric fan, was an important exhibit on this stand.

The Delco Light Co. exhibited an extensive range of electric light and power plant, including small generating sets, varying in capacity from 600 W to 1,250 W. "Frigidaire" electric refrigerators were also shown; the "Frigidaire" cooling coil is said to be equivalent to a 200-lb. block of ice, but maintains a temperature well below 50 degrees below zero.

Electricity in the homestead was demonstrated by the Chester Corporation, whose exhibits were housed in a tent 40 ft. by 20 ft. There were exhibits demonstrating the use of electricity for lighting and heating, "Hotpoint" cooking and ventilating; Beatty & Hurley washing machines, vacuum cleaners, boilers, ironers and other domestic apparatus, were also exhibited. Fig. 4 shows an electric fire which commanded great attention. Of outdoor apparatus there were churns, sterilising plant for the dairy, electric refrigerating plant, water pumps, barn machinery, an electric hay-chopping machine, a milk-separating machine, a churning machine, a sheep-shearing machine, a milk-cooling appliance, and a steriliser and water

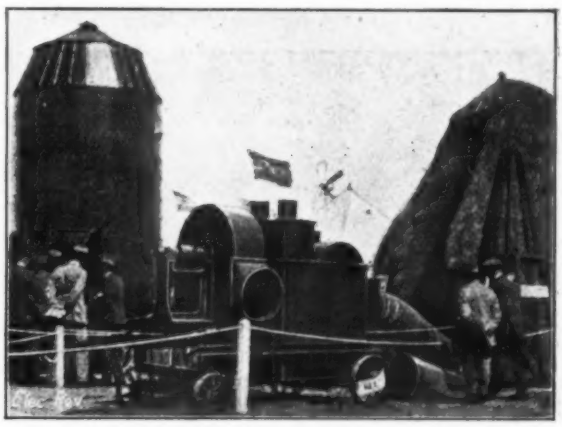


Fig. 3.—Electrical Crop-drying Plant.

pump. The tent was surrounded by a practical demonstration of the construction of a 6,000-V overhead transmission line, with a 6,600/400-V transformer, &c. Fig. 1 is a view of the tent and part of the transmission line.

At the stand of the Institute of Agricultural Engineers, Oxford University, electric power was used for driving the blower, fig. 2, which forces hot air into a stack of green material, such as grass or cereals, for the purpose of artificial drying. The power required for this purpose is in the neighbourhood of 20 horse power.

Dynamo exhibits were displayed on seven stands. Various types of oil engine-driven electric lighting sets were shown by Messrs. Petters, Ltd., of Yeovil, including the "Alpha" Petters lighting set consisting of a 1½-b.h.p. petrol-paraffin

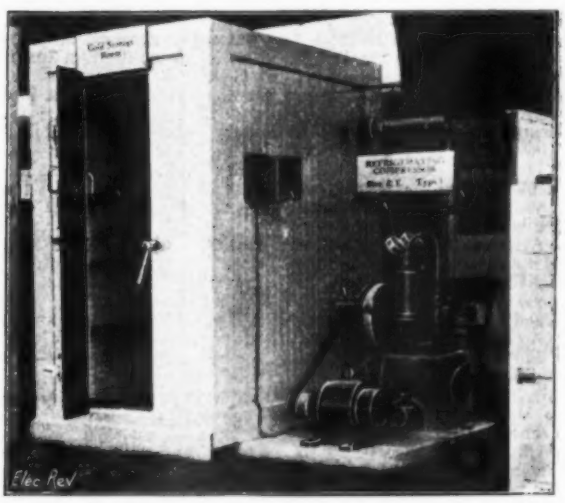


Fig. 4.—Cold Storage Equipment.

engine, dynamo and switchboard; and a 5-b.h.p. oil engine, dynamo, and switchboard set. Messrs. Blackstone & Co., of Stamford, had a big stand fully equipped with agricultural implements, including a spring injection heavy-oil engine directly coupled to a dynamo for supplying energy for general farm purposes. An electric lighting set, consisting of a dynamo belt-driven by a 2½-b.h.p. "Eagolyte" engine, for fifteen lights and upwards, was demonstrated by the Eagle Engineering Co., of Warwick, whose general exhibits were very comprehensive.

The Glasgow Electrical Engineering Company, Ltd., showed

a windmill electricity generating plant complete with a 22½-ft. mast, switchboard and battery. Although gas engines were the main point of appeal at the stand of the National Gas Engine Co., Ltd., a small vertical engine was demonstrated, working a small dynamo, whilst a horizontal unit, 4 b.h.p., was exhibited driving a heavier type of dynamo. To operate a mechanical lubricator of three types, the Vacuum Oil Co. employed a ¼-h.p. electric motor on a demonstration table.

Messrs. Bamfords, Ltd., had on view over 60 farming devices, including a 1-kW lighting set driven by a 2½-h.p. oil engine. Another well stocked exhibit was that of Messrs. R. A. Lister and Co., who showed a 100-V, 4-kW "Lister Bruston" lighting plant; a 1.5-kW direct-coupled Lister lighting set, complete with switchboard and stand; and a 1-kW belt-driven unit with switchboard, battery and rack. Messrs. Lister had a big range of dairying utensils on view.

Electric lighting plant of several types formed part of the composite display of Messrs. Boulton & Paul, Ltd. Interesting exhibits included an electric lighting plant, 1.5 kW, running on paraffin fuel, supplying energy for electric irons, churns, washing machines, &c., with a pulley for driving other

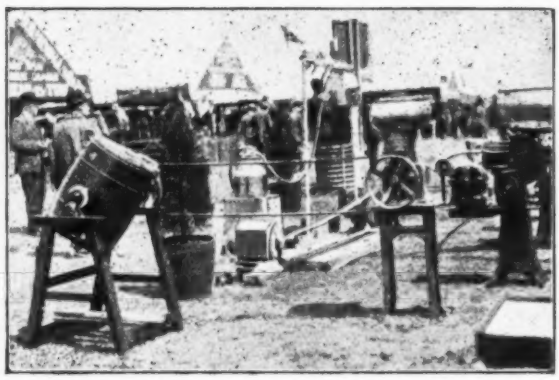


Fig. 5.—Cream Separators and Churns.

machinery; a petrol belt-driven 1-kW lighting set with a controller switchboard, suitable for an installation of 50 lamps; and a paraffin driven 4-kW electric lighting plant, suitable for power and lighting purposes for large country houses and farms. The Singer Sewing Machine Co., Ltd., demonstrated on the Corporation supply, twelve sewing machines of various sizes requiring from 45 to 200 W.

Amongst the standholders who employed electricity supplied free of charge by the Chester Corporation for the purpose of lighting, fans, and heating, were Reade Bros. & Co., Ltd., veterinary requisites; Polienta Co., Ltd., cattle medicinists; Spillers, Ltd., animal and poultry food merchants; agricultural information bureau, fertiliser stand, the British Sulphate of Ammonia Federation; Sutton & Son, seed specialists; J. Carter & Co., seed specialists; Gartons, Ltd., seed specialists; Zacharias & Co., waterproof makers; T. Grayson, Ltd., milk churn; Tangyes, Ltd., engines; the Sun Insurance Co.; the *Daily Mail*; Hewthorn & Co., veterinary preparations; Mappin & Webb, jewellery; Calthorp Bros. and Co., cattle food makers; Olympia Oil & Cake Co., Ltd.; W. Cooper; Nephewes, Ltd., veterinary preparations; Allied Newspapers, Ltd., heating and driving linotype machine; the Albion Cake Co., cattle foods; Charles Jones & Co., farm implements; Roger Errington, veterinary preparations; the ambulance room; fire station; the president's apartment and the secretary's office.

American electrical plant was exhibited by the Kohler Co., of London, which directed attention to automatic electric lighting and power plant, including the Kohler model D, 1,500-W, 110-V, d.c. set, with a 4-cylinder, water-cooled, combined engine; and the model S, 800-W, 110-V, d.c. automatic generator, with a 2-cylinder, air-cooled engine.

Lighting sets of 1½ and 3 h.p., operated by oil engines and equipped with 16-120-Ah batteries, made by Fuller's United Electric Works, of Chadwell Heath, were among the features of Messrs. Fairbanks, Morse & Co.'s exhibit.

The Haslam Foundry & Engineering Co. employed a 3-h.p. electric motor to drive a compressor for a cold storage refrigerating plant. Messrs. Watmough's, Ltd., showed the utility of the electric drive for grinding, crushing and pulversing corn and any other material, for which a 3-h.p. motor supplied adequate power. The Vigzol Oil Refining Co., Ltd., employed a ¼-h.p. motor to drive an oil-refining plant. Using a 15-h.p. motor, Messrs. J. Harrison, Carter, Ltd., of Dunstable, demonstrated the operation of a cake crusher and a combined elevator and disintegrator for corn, food stuffs and fertilisers, having an output of 5 sacks per hour.

Of the fifty exhibits on the stand of Harrison, McGregor and Co., Ltd., several were shown in operation. For instance, a 3-h.p. motor was seen belt-driving a stationary binder, and a 15-h.p. motor propelling a countershaft from which was driven a complete set of barn machinery: this included a combined grinding and crushing mill, grinding 8 to 11 bushels, and crushing 25 to 30 bushels per hour; a chaff-cutter of 12 to 15 cwt. per hour capacity; a root cleaner and pulper, 4 to 5 tons per hour; and a double roller cake mill, 30 to 35 cwt. per hour.

Martins Cultivator Co., Ltd., had in service a 10-h.p. motor driving two swarth turners, a potato digger and combined side rake, a swarth turner and tedder, and also a ¼-h.p. motor driving a rotary pump. To drive a corn mill with a capacity of 3 to 3½ sacks per hour, Messrs. Barford & Perkins, whose stand was well stocked with various farm implements, used a 5-h.p. electric motor.

Grinding machines were the speciality of Messrs. W. S. Barron & Sons, Ltd., of Gloucester, who demonstrated a 15-h.p. motor, belt-driving a countershaft from which was operated a geared impact grinding machine, and a 36-in. "Dreadnought" grinding mill; another 15-h.p. motor was direct-coupled to an impact grinding machine. Messrs. Robert Boby, Ltd., exhibited two motors, ¼ h.p. and 1½ h.p., directly coupled and belt-driving respectively—in attachment with refrigerator compressors. Fig. 3 illustrates one of the compressors and the cold storage equipment.

The value of electricity to the dairy farmer was exemplified by Messrs. G. Llewellin & Son, of Haverfordwest. They showed a ¼-h.p. motor driving a 35-gal. separator and a similar motor driving an 18-gal. churn. The De Laval Chadburn Co., Ltd., exhibited a vacuum pump for a milking machine capable of dealing with the product of 40 to 60 cows. Fig. 5 shows some electrically-driven cream separators and churns.

An electric-driven flour milling machine of the latest type sextuble plansifter (for dressing flour), was the feature of outstanding interest at the stand of T. Robinson & Co. Messrs. Dawson Bros., Ltd., Gomersal, demonstrated an electrically-driven bottle-washing machine; this machine automatically soaks, brushes inside and out, rinses and sterilises 1,000 bottles per hour. The power unit also operated a milk bottle filling, measuring, and corking machine, capable of dealing with 160 dozen bottles per hour. To the Melotte Separator Sales Co., energy was supplied for four 1/5-h.p. motors, each direct-coupled to milk separators, dealing with 40 to 72 gallons of milk per hour according to size, one of which was demonstrated. Vaccar, Ltd., employed a 3-h.p. motor to drive a vacuum pump for a milking machine capable of dealing with 40 cows. The purpose of an installation driven by a 7½-h.p. motor, of Messrs. Thomas & Bishop, Ltd., was to depict good and bad belting. Messrs. W. H. Smith & Son showed a 3-h.p. motor, belt-driving a bottle-washing machine.

A model house (furnishing exhibit) by Richard Jones & Co. was equipped with electric lighting, kettles, cooker and irons. The electrical installation of this stand was supplied by Messrs. Williams, Gamon & Co. (Kaleyards), Ltd., Chester.

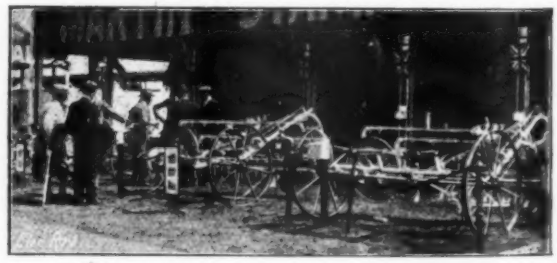


Fig. 6.—Electrically-driven Agricultural Implements.

The stand of Messrs. Ransomes, Sims & Jefferies, Ltd., Ipswich, was of unusual interest, showing as it did, self-contained electrical appliances and devices supplied from the Corporation mains. On view were a 20-b.h.p., d.c. motor mounted on wheels, for agricultural purposes; and a 15-h.p. motor belt-driving a "Homestead" complete thrashing and finishing machine, capable of dealing with 45 bushels of wheat per hour, 50 bushels of barley, or 70 bushels of oats.

The only electric truck on show was that entered by Messrs. W. Goodyear & Sons, Ltd., of Dudley.

Fig. 6 shows some of the electrically-driven agricultural implements.

Petrol Tower Wagon for Tramways Department.—The Tramways Department of the Exeter Corporation has recently acquired a petrol motor tower wagon from the Associated Equipment Co., Ltd. The basis of the vehicle is a standard A.E.C. 28-h.p., 2-ton chassis. The tower, which is mounted immediately in the rear of the driver's cab, is built in two sections, one portion rising within the compass of the fixed section of the superstructure. A two-piece scaling ladder with iron sides and rungs is fixed on the near side, and as the tower is elevated it carries with it the ladder extension leading to the platform. The latter is so constructed that it can be turned in a complete circle and locked in any position in such a way that complete stability is ensured at its maximum elevation of 22 ft. At the rear of the vehicle is a commodious locker in which tools and other equipment can be carried.

Short-Wave Radio Communication.

Long-Distance Achievements by Amateurs.

HITHERTO when discussing long-range radio communication it has been customary to assume the expenditure of kilowatts of energy and the use of wave-lengths of thousands of metres. The remarkable facts which have recently come to light, however have caused students of the subject to take stock of the situation anew. That attention has in recent times been re-directed to short waves, *i.e.*, under 100 metres, is due to amateur experimenters having obtained surprising results over long distances with very small power, and the investigation of the new effects which have been recorded may influence future development profoundly.

The McMillan Arctic Expedition.

The development of the short wave, in the neighbourhood of twenty metres, undoubtedly appears to be the most important aspect of radio research at the moment and it is for this reason that particular interest attaches to the American McMillan Arctic Expedition which left America on June 20th. Accompanying the expedition is Mr. John L. Reinartz, whose name is well known to every radio experimenter for his pioneering work with short waves. The receiver circuit bearing his name, which is becoming increasingly popular in this country, remains one of the most efficient of short-wave receivers, despite the introduction of much-advertised new circuits of late. Hitherto short waves have been almost entirely neglected and the work of Mr. Reinartz with the Arctic Expedition will be an extensions of his research in this direction, for he has taken with him a transmitter designed particularly for the twenty-metre wave-length; the Expedition is equipped with three other transmitters, for 40, 80 and 150 metres respectively, and the seaplanes are equipped with telephony apparatus. Mr. Goyder, who has just left Mill Hill School (N.W. London) succeeded in maintaining communication with the expedition for some days just before it crossed the Arctic Circle. He used a 250-watt valve and a wave-length of 40 m., with a single-wire aerial and a Reinartz receiver. The explorers hope to reach a hitherto unexplored region of the Arctic and the enormous distance which will separate them from receiving stations in America will make the tests severe ones, even for the short wave-lengths.

The Ridley Achievement.

Concerning recent amateur communication with Australia in daylight, as a matter of interest, it is understood that such communication was first established by Mr. J. H. D. Ridley (G5NN station, London) operating on a wave of 18 metres. When the oscillation frequency of such a short wave is taken into consideration, due credit must be given for the stable operation of the Mullard 0/250 transmitting valve that was used (fig. 1 shows a similar type). It is 14¼ in. long and 5 in. in diameter; its anode current-grid voltage characteristics are shown in fig. 2 and a special feature is the method of assembling the internal parts so that filament renewals may be carried out without disturbing the other electrodes and internal structure. The long re-entrant glass tubes at either end provide high insulation between electrodes and the grid lead is kept far away from the filament leads. Mr. Ridley used an input of under 200 watts to the plate and a special loosely coupled circuit. His aerial is 37 ft. in length and 30 ft. high, the counterpoise being 40 ft. long and 10 ft. above the ground.

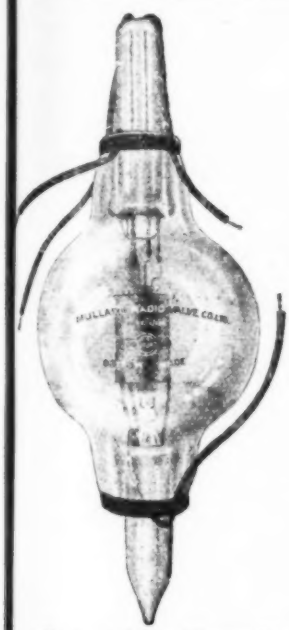


Fig. 1.—A Mullard Transmitting Valve.

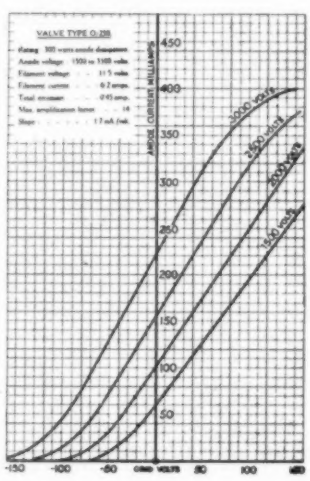


Fig. 2.—Type 0/250 Transmitting Valve Characteristic.

The message was received with the aid of a "low-loss" 2-valve tuner at 4.45 p.m. Melbourne time on April 26th, by Mr. B. Pringle, senior engineer on the staff of Amalgamated Wireless (of Australasia) Ltd., who logged all that was said about strength 6. It will be noted that the date precedes the transmission of 2OD (referred to below) so that Mr. Ridley has the distinction of being the first amateur operator to communicate with Australia on very short waves in daylight.

The Simmonds' Tests.

The recent achievement of Mr. E. J. Simmonds, the well-known amateur, in establishing radio communication between his Gerrard's Cross station (G2OD) and that of Mr. Maclurcan (A2CM) in Sydney, Australia, on a 20-metre wave is of interest for several reasons. On May 2nd signals were exchanged between 0552 and 0715 G.m.t., while on May 3rd messages were received and acknowledged for half an hour from 0520 G.m.t., the significant facts being that the short-wave messages travelled such a long distance when the whole of the path was in daylight and that they faded when darkness fell. In November last Mr. Simmonds established communication with Australia on a 100-m. wave, and he then found the signals were strongest and clearest during the hours of darkness. On May 17th, 18th, and 19th Mr. Simmonds communicated with New Zealand (NZ4AG) for the first time for three days in succession (wavelength, 22 metres) between 0500 and 0600 G.m.t., and it is interesting to note that these tests were accomplished with the aid of Marconi-Osram valves, the T 250 type (fig. 3) being used for transmitting and the D E Q type (fig. 4) for reception.

Fig. 3.—Marconi-Osram T250 Valve.

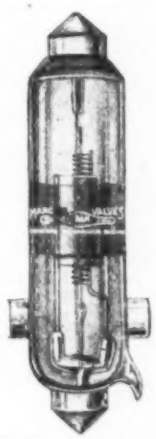


Fig. 4.—Marconi-Osram D E Q Valve.

The Marcuse Exploit.

Amateur experimenters met with such success last year that they are optimistically busy laying plans for next winter's work. Mr. Gerald Marcuse, who established communication with the Rice Expedition in Central America, recently established short-wave communication by telephony with the U.S.S. *Seattle* when she was 400 miles from Sydney, New South Wales. Mr. Marcuse first communicated with the ship by telegraphy; his signals were reported to be very strong, and he was requested to try speech. Despite bad interference at the Australian end, the speech was received well. Mr. Marcuse, who has quite a number of long-distance communications to his credit, including Brazil, Australia, and New Zealand, has recently added a modulating system and also an independent drive circuit to his transmitter in order to experiment with telephony. He uses Marconi-Osram valves of the T.250 type both for his modulator and main oscillator, and has found that the periods of audibility between this country and New Zealand are much greater on 45 metres than 90 metres.

Fresh Platinum Finds.—Reports of fresh discoveries of platinum come from the Pietersburg, Carolina, Waterberg, and Rustenburg areas. There is keen competition for farms, and the big groups are steadily increasing their interests.—*Financial Times.*

Electrical Development in Spain.

Important Water-power Schemes.

THE British Commercial Secretary at Madrid (Capt. U. de B. Charles, C.B.E.), has forwarded a report* on the above subject to the Department of Overseas Trade. The report is dated March, 1925, and in the introduction it is stated that, apart from the poor harvest, the year 1924 showed considerable advancement. The wave of depression which has swept Europe has not affected Spain so seriously as other countries. The Moroccan problem remains, however, but it is considered that once this matter is settled the country should be in sight of the carrying out of a wide programme of development. The financial position of the State improved during the year 1923-24, and it was expected that the deficit would be still further reduced in the last financial year. With the possible exception of Barcelona there is very little unemployment in Spain at the present time. Labour troubles were few and far between during the period covered by the report, the only serious strike being that of the Asturias coal miners in November last which was settled in favour of the men. At the date of the report there was some talk of a metallurgical strike. Capt. Charles says that a feeling of stability and security has been established throughout the country.

Foreign Trade.

When the report was prepared the total figures relating to foreign trade during 1924 were not available. All that could be obtained was information regarding quantities imported and exported during the first six months of the year. Employing this as a basis of comparison it is observed that several important classes of electrical goods imported showed increases over the 1923 figures. For instance, the imports of dynamos, motors, transformers, switchgear, &c., during the first six months of 1924 amounted to 550 tons in the case of goods weighing from 1 to 3 tons and to 1,420 tons in the case of goods weighing upwards of 3 tons. In the first half of 1923 the quantities were 400 tons and 820 tons respectively. The share of the United Kingdom amounted to 100 tons in the first class and 65 tons in the second class. The imports of electrical measuring instruments rose from 47 to 95 tons (United Kingdom, 3 tons); electrical wires and cables, covered with textiles and exceeding 1 cm. in diameter, from 114 to 256 tons (United Kingdom, 124 tons), and aluminium cables from 6 to 165 tons. On the other hand imports of the following items decreased:—Insulators, from 500 to 240 tons; copper cables made of a wire of 0.5 mm. diameter or more, from 38,200 to 17,180 tons (United Kingdom, 17,000 tons); electric locomotives, from 380 to 80 tons; internal combustion engines, from 1,522 to 1,298 tons (United Kingdom, 223 tons); electric stoves, heaters, &c., from 41 to 18 tons; and accumulators, weighing 50 kg. or more, from 82 to 11 tons (United Kingdom, 1 ton).

Metal Production.

In the first nine months of 1924 shipments of copper pyrites amounted to 1,677,319 tons, as compared with 1,295,544 tons in 1923. The increase in output which commenced in 1923, after the signature by all European producers of an agreement under which output was adjusted to demand and selling prices raised to a remunerative figure, has been maintained, and many of the smaller mines have now resumed operations and the larger ones have undertaken development schemes. The high price of lead in the past year resulted in the re-opening of a number of mines which were practically closed down. In the Sierra Almagrera, the important lead district in the province of Murcia, pumping machinery is being actively installed and it is hoped to re-open the more important workings at an early date. The export of lead in bars during the first half of 1924 was 44,900 tons, as against 41,900 tons in the equivalent period of 1923. The increased output of zinc ore which was reported in 1922 was maintained in 1923, the exports of bars rising from 71,996 to 102,313 tons.

The increase in the use of electric power in mines and metallurgical works has been very rapid. The aggregate output of the motors installed in mines rose from 42,693 h.p. in 1922 to 59,472 h.p. in 1923. During the same period the aggregate power of electrical plant employed in furnaces, foundries and rolling mills, rose from 69,481 h.p. to 104,598 h.p.

The value of the finished copper output in 1923 was 60,639,678 pesetas, as compared with 34,915,337 pesetas in 1922. The equivalent figures for lead were 91,742,491 and 68,314,516 pesetas, and those for zinc 10,846,548 and 6,412,731 pesetas.

Hydro-Electrical Development.

The construction of water-power stations which had already been commenced proceeded slowly during the period under review, and there appears to have been little desire to embark upon any new hydro-electric schemes of importance. Only four undertakings were completed during 1924, *viz.*, a 2,000-h.p. development at Peñas de Castro on the Tagus for a cement factory, and three small stations (100 h.p. each) in the province of Guipuzcoa. Work is still proceeding on the Jucar River, where the Hidroeléctrica de Castilla has already expended 30 million pesetas on a station to develop 15,000 h.p. The plant of the Gallega de Electricidad on the Salto del Tambre (Galicia), which has cost 16 million pesetas, is nearing completion, and the Hidroeléctrica del Cantábrico is duplicating its 8,000-h.p. plant at Somiedo (Oviedo). The Hidroeléctrica Española has acquired the Tranco del Lobo falls, developing 3,000 kW, and has built a reservoir and provided an important reserve for its station at Molinar, which is lower down on the same river. The Sociedad Productora de Fuerzas Motrices has obtained further capital and formed a new company, the Sociedad Impulsora de Negocios Eléctricos, with a view to the further development of the hydro-electric resources of the Valle de Arán. In the Sierra Nevada the S.A. Tranvias Eléctricos de Granada has now opened the Durcal station which will supply power for the company's tramway and the new electric railway which has been opened from Granada to the Sierra. All the important power companies find it necessary to install reserve stations for use in the dry season. One of the most important recently constructed is the 15,000-h.p. steam station of the S.A. Electra de Viesgo, at Santa Cruz de Ujo (Asturias). This is capable of extension to 40,000 h.p. and will serve as a stand-by for the seven hydro-electric stations operated by the company. The steam station at Valencia of the Sociedad Anónima de Fuerzas Electrica, in which there are important British interests, was finished during the year. This has an output of 25,000 h.p., which will be distributed by a local co-operative society. It is reported that an agreement has at last been reached between two Spanish banks on the question of the much-disputed Douro Falls, which are estimated to be capable of producing 500,000 h.p., and it is hoped that the development of this important scheme will not be much longer delayed. There is also reason to believe that there is some prospect of working being commenced on the Alverche and Cafio Concessions (Madrid) in the current year. The approximate maximum water-power available is estimated at 6 million h.p. Concessions have already been granted in respect of over 4 million h.p.; 1,261,118 h.p. is in actual use, and 2,160,000 h.p. is under construction. At the close of the year water-power concessions were made subject to a number of special conditions. These include the requirement that Spanish plant and materials must be installed whenever they can be obtained. A recent Royal Decree designed to assist industry included a provision for compulsory expropriation in connection with hydro-electrical enterprises.

Railway Electrification.

A fair amount of railway electrification was completed during the year. The Puerto de Pajares section of the Norte Railway was opened for traffic and is said to be working satisfactorily. A new electrified line was opened between Granada and the Sierra Nevada during the year. This was built by private enterprise and links up a number of villages in the Genil Valley. The Granada Tramway Company has completed its line to Durcal, and a line from Durcal to Motril will probably be built later. The Bilbao-Santander Railway has obtained its shareholders' sanction to electrify the portion of the line between Bilbao and Algorta and tenders are to be invited immediately. The Ferrocarriles Vascongados has decided to electrify its line from Bilbao to San Sebastian. The work is to be supervised by an Italian engineer and the power will be supplied from a Diesel-engine station which is to be erected. Work is proceeding on the electrification of sections of the Transpyrenean Railway from Ripoll to Aix-les-Thermes.

On December 30th last the Gran Metropolitano de Barcelona opened to the public its line from the Plaza de Cataluña to the Plaza Lesseps. Further extensions will shortly be ready, providing two services of 3,600 and 4,500 metres respectively. Another company, the F.C. Metropolitano de Barcelona S.A., is constructing an underground railway at right angles to the above line, but it will be some time before it is opened to the public. In Madrid underground railway construction is also proceeding. In June, 1924, the Metropolitano Alfonso XIII opened the Sol-Ventas section and work is proceeding on two other sections. When this is completed there will be direct underground communication between the lines of the Madrid-Zaragoza-Alicante Railway and those of the Norte.

At the same time the development of the steam railways is proceeding and there is reason to believe that more than one British manufacturer has taken up the question of co-operating with existing Spanish factories, at any rate on the technical side, and in this way obtaining some share of the available business.

Methods of Business.

Capt. Charles says that the essentials of business in Spain can be summed up in two words—efficiency and adaptability. Although credit is absolutely indispensable to business in Spain, the danger of granting indiscriminate credits is, of course, greater during the depressed condition of some trades than in normal periods. Care is consequently necessary, but if the judgment of representatives of Manchester and other North of England firms with thirty years' experience is any criterion, Spain is one of the safest markets in Europe to-day if its peculiarities are studied. The language question is very acute; the knowledge or ignorance of Spanish often makes for a gain or loss of business. In spite of the high cost of British goods, Spain is certainly a potential market if British firms will only study and, what is more important, accept whenever possible, local conditions and requirements.

* Stationery Office. 2s. 6d. net.

The Inquiry at Southend.

Submarine Diesel v. Steam Plant.

Col. T. C. EKIN, M.Inst.C.E., on behalf of the Electricity Commissioners, held an inquiry at Southend on July 14th into the application of the Corporation for sanction to borrow £40,000 for new plant and works; £7,100 and £2,980 in respect of excess expenditure on previously-sanctioned loans; and £25,000 for a.c. mains, converting plant, switchgear and transformers. Mr. J. A. Lee, engineer-assessor, and Mr. H. Douglas, financial adviser, sat with Col. Ekin; Mr. R. M. Montgomery, K.C., appeared for the Corporation, and Mr. Craig Henderson, K.C., represented Westcliff Ratepayers' Association and the Southend branch of the National Citizens' Union. Watching briefs were held by Counsel on behalf of certain ratepayers, Mr. R. Birkett, the borough electrical engineer, and members of the Town Council. We are indebted to the *Thameside Mail* for the following notes of the proceedings

Mr. MONTGOMERY, opening the case for the Corporation, said that a majority of the Council favoured engines made by Messrs. Belliss & Morcom, Ltd., on the lines of the German submarine Diesel engines of the war period and that majority wanted permission to borrow money for the purchase of two of those engines and the regularisation of excess expenditure on previous loans. After answering questions put by the chairman regarding the method of selling the output and the rating of the engines already installed, Mr. Montgomery said that while the simultaneous load on the three stations of the Corporation, during the winter 1925-26 would be 7,056 kW, the total capacity was 7,860 kW, leaving a reserve of 10.4 per cent. The aggregate of the simultaneous demands on the stations would be 7,199 kW. Opposers of the scheme held that Mirrlees engines would be preferable, but the applicants considered it better to have engines of a type with which the staff was acquainted. He showed that there was a net difference of about £2,500 in favour of Mirrlees engines, G.E.C. generators being used in both cases. The difference would be reduced to £1,300 if the Mirrlees engines were fitted with oil-cooled instead of water-cooled pistons.

Mr. W. H. Patchell was called as the first witness. He gave it as his opinion that the submarine Diesel engines at present in use at Southend were entirely satisfactory. The Belliss engines would afford interchangeability and the raising of steam at the rate of 1 lb. per kWh from exhaust gases for use by the steam plant at the London Road station. Under cross-examination by Mr. Craig Henderson, Mr. Patchell admitted that he had not been given sufficient notice to enable him to make an exhaustive examination of the Corporation's submarine Diesel engines. He agreed that for outputs above 500-kW a slower-speed engine was superior; and he also concurred in a suggestion by Mr. Henderson that the Corporation would eventually have to scrap the Diesel plant and go in for steam plant, but would not state whether it would be better to do this immediately. He pointed out that he was not asked to give advice on this point, but to choose between the two types of Diesel engines in question.

Mr. ROBERT BIRKETT, borough electrical engineer, was called and stated that the original submarine Diesel engines were installed on his advice and he had later advised the purchase of more of these engines until the Corporation's electrical policy had been definitely settled. He was without question in favour of the type of engine preferred by a majority of the Council. He agreed with Mr. Patchell on the questions of interchangeability of spare parts and labour.

COL. EKIN asked for estimates of the running costs of the Mirrlees and Belliss engines respectively.

Mr. BIRKETT produced these, and said that eight tenders had been received. The two in question had been accepted because they were lower in price than the others except one which was rejected because it came from a German firm. It was proposed on the advice of Messrs. Handcock & Dykes to install converting plant at the Leigh and Thorpe Bay stations to enable current to be interchanged with the London Road station.

Upon the following day Mr. BIRKETT continued his evidence and admitted that labour costs amounting to about £1,600 had been incurred in cleaning engines which were supposed to be new, and that Messrs. Belliss & Morcom had been paid an amount of £300 for an exhaust silencer which was extra to the contract. He agreed that in 1921 he had stated that the low-speed land-type Diesel engine was superior to the submarine high-speed type and that steam was more reliable than either. He had not tried to provide Southend with electricity plant on a piecemeal basis; he was still turning over in his mind the question of turbo-alternators. In reply to a question by Mr. Henderson, witness admitted that he had allowed Messrs. Belliss & Morcom to remove a quantity of spare parts from the London Road station although the order for the new engines had not yet been signed. Examined upon his attitude to a report by the late Mr. C. H. Wordingham on the future supply of electricity in Southend, Mr. Birkett admitted that while Mr. Wordingham's estimate of future consumption had been too small, his own had been 1¼ million kWh lower than that. He considered that the alternator recommended by Messrs. Handcock & Dykes was unnecessary at present, although he would use it if he was compelled to do so. He admitted that he did not like to have to work with the experts in drawing up specifications, and the Electricity Committee allowed him to prepare the specifications for the two engines which formed the subject of the inquiry. He also admitted that by including a long list of spares, not considered necessary by the makers but which he deemed essential, he had increased the tender of Messrs. Mirrlees, Bickerton & Day from £26,148 to £27,693 (including E.C.C. generators). The lowest tender was put in by Messrs. Mirrlees, Bickerton and Day, who quoted £27,693 against Messrs. Belliss & Morcom's £27,916 (using Lancashire generators). He denied that he informed his Committee that he had given an undertaking to the Electricity Commissioners not to use two-cycle engines, but he did state, on the authority of a discussion in his office, that Messrs. Handcock & Dykes would not approve of two-cycle engines. Mr. Birkett said that he was not misleading members of the Council when he sent them a "confidential" letter urging the purchase of German submarine Diesel engines from a Gillingham firm, which it was intended that Messrs. Belliss and Morcom should re-condition for service. It was not his wish to say anything against the Mirrlees engine. He maintained that the German Diesel engines had done their work well.

Councillor JOHNSON, a member of the Corporation, said that he believed the existing plant to be the best that the town could obtain.

Mr. CRAIG HENDERSON, K.C., in opening the case against the proposed loan, alleged that there had been a want of candour in one item relating to the excess expenditure of £10,080; this item, "overhaul, &c.," accounted for no less than £2,500. This included £1,100 for rough labour. Although the work was to be carried out by Messrs. Belliss & Morcom, Counsel said that the past few years had shown that Mr. Wordingham had been right and Mr. Birkett wrong. The latter had persuaded the Corporation to buy submarine Diesel engines and nothing but these had a chance. They asked for a full and proper scheme to be put before the Commissioners; he wanted the Inspector to be thoroughly satisfied whether the figures put forward were reliable. Mr. Birkett had condemned the submarine Diesel engine in his correspondence with the Commissioners, but he tried to find fault with the low-speed machine without knowing what it could do. He had claimed that submarine Diesels could be quickly reconditioned and erected and yet it took 11 months and cost £1,100 for rough labour to do the job. After stating that Mr. Birkett objected to a supply from the County of London Company, Mr. Henderson referred to the manner in which Messrs. Handcock & Dykes were "dropped" when their reports were unfavourable to the Electricity Committee, and said that if it were left to Mr. Birkett the a.c. mains would never be laid unless he was overruled. The whole electrical policy of Southend was opposed to that of the Electricity Commissioners throughout the country; Southend was isolating itself from other districts because it had three separate stations which were not linked by h.p. cables. With regard to the tenders for the new engines, Counsel said that "English-made land-type Diesels" were stipulated, but when the minute came before the Council the words "English-made land-type" were omitted. The attention of the Corporation had never been drawn to the facts that there were lower tenders than that of Messrs. Belliss and Morcom, and that the Mirrlees engines had a lower fuel consumption.

Mr. A. H. DYKES, called as a witness, said that he had been asked to report on the undertaking. He had difficulty at times in obtaining information. After inspecting the Mirrlees engine he recommended its acceptance. He considered that this was a cheaper and better engine.

Mr. TOWNEND, of Messrs. Handcock & Dykes, said that he had interviewed a deputation from Southend at his office. He considered that it would be a backward movement for Southend to continue to use an engine based on the type made by the Germans in 1917. The Mirrlees was a modern engine.

Major W. V. WEBER, a member of the Council, then gave evidence and said that he objected, in the case of the first three submarine Diesels, to the town paying £5,500 each for engines that had cost £1,100 each. The Electricity Committee was always told that the engines were new and were wanted immediately, but it had always taken nearly a year to install them. Major Weber complained that the Committee was never given full information or reports of breakdowns. He said that Messrs. Handcock & Dykes's report had been disregarded and Messrs. Mirrlees, Bickerton & Day wrote and asked why their tender, which was the lowest, had not been accepted. This letter did not reach the Mayor until three or four weeks later; it was found in the office of the borough electrical engineer. He maintained that the Corporation was retarding electrical progress, and said it was time that the Commissioners investigated the matter. Major le Masurier, C.B.E., also gave evidence.

In conclusion, Mr. HENDERSON contended that Mr. Birkett had set himself out to flout the Commissioners; he asked the Commissioners to compel Southend to come into line with the rest of the country.

Col. EKIN said that before coming to a decision the Commissioners would have to seriously consider the electrical policy of Southend. They would not come to a decision on the matter until they knew what the views of the Council were in respect of the future. He declined to proceed with the second part of the inquiry until after the long vacation.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

A New Electric Block.

We recently saw the new electric block illustrated herewith, which is the latest product of Messrs. S. H. HEYWOOD & Co., LTD., Reddish, nr. Stockport, under test and giving favourable results. This machine, which is designed to give complete accessibility to all working parts, is constructed around a framework consisting of two cast-steel pan-shaped end plates rigidly connected by cross stays. The driving motor, fig. 1, is mounted on angle irons between the end plates,

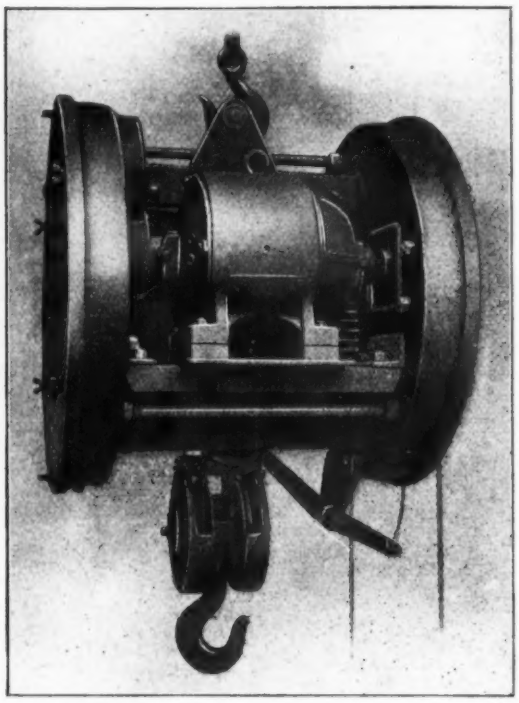


Fig. 1.—Electric Block, showing Motor Housing.

one of which contains the brake equipment, including the brake pulley, carried by one end of the motor shaft. This pulley is easily removable by means of a pulley-removing device of the usual type attached to the centre of it. The other end of the motor shaft carries the driving pinion housed in the opposite end plate. It can be readily removed by dismantling a grooved plate covering an aperture in the end through which the motor shaft with the pinion may be slid

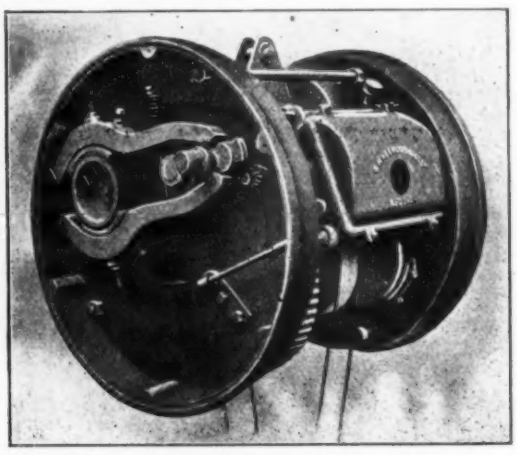


Fig. 2.—Electric Block, showing Brake and Controller.

with the motor from position, the end plate itself being internally cone shaped. The motor is of the standard "Hall" type.

The controller is of the drum type, and is situated on the opposite side of the frame, fig. 2. It has five positions other than the "start," and is operated by the usual chain and lever device. The resistances are carried in the opposite "pan," and are built on five cylindrical bobbins. The controller is totally enclosed, but every part is rendered accessible by means of a hinged door. The contact barrel is mounted on ball bearings, and the whole can be lifted from the bearing housings after a simple operation entailing the disconnection of an extension of the barrel spindles, which carries a pinion affording the automatic operation of the brake. Arc shields are fitted between all the fingers.

The automatic braking operation is effected by means of cams engaging with rollers on the ends of the brake arms, the cams being carried on a central spindle geared to the contact barrel shaft of the controller. The cam operating surfaces are so shaped as to give a uniform pressure increase during their operation. The brake shoes are lined with hard "Ferodo" fabric, and are suspended loosely about the pulley from the brake arms, so as to ensure a uniform surface pressure on the pulley. The equipment in both end chambers is completely encased by sheet steel covers, which are easily removed by means of thumb screws. The winding barrel is mounted on a shaft supported between and by the two end cases. It may be removed bodily by withdrawing the shaft through one of the ends. The barrel spur wheel is bolted by means of fit bolts to the barrel itself, thus eliminating the use of keys. The lubrication of all bearings is by screw-down grease cups conveniently located outside the framework.

A Swiss Arc Welder.

Following a study of the phenomena of the electric arc as produced between metallic electrodes, the SOCIETE DES ATELIERS DE SECHERON, of Geneva, recently introduced portable alternating-current arc-welding apparatus which is claimed to give satisfactory technical results, at least equivalent to those obtained with direct-current plant, and at a much lower first cost, this being only about one-third of that of the d.c. outfit. The apparatus consists of a special static transformer the secondary voltage of which adapts itself automatically to the class of welding being done. A commutator regulated by a hand wheel shows the current employed, the use of delicate instruments being thus avoided. For use in erecting shops the coils may be wound to work with a.c. at 250, 380, or 500 volts.

A "Flywheel" Motor Compressor.

Some interesting particulars are given in *Chemical and Metallurgical Engineering* of new type of air compressor brought out by the CHICAGO PNEUMATIC TOOL CO., 6, East 44th Street, N.Y. This compressor uses a specially designed synchronous motor, called the "flywheel" type, particularly adapted to single straight line air compressor operation. The motor is designed with the rotating element outside the stator, which is mounted in a cradle support bolted to the compressor

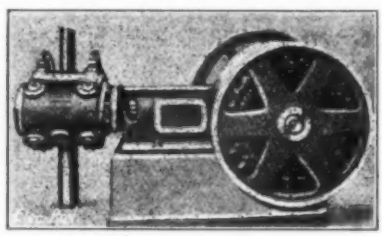


Fig. 3.—The "Flywheel" Motor Compressor.

frame. This support is bored concentric with the compressor bearing to ensure alignment of the stator and a uniform air gap when assembled. The rotor has the appearance of an ordinary flywheel, the face being crowned for belting to an exciter or other auxiliary. The poles are mounted on the inner rim of this wheel. With this construction, the weight and consequently the cost of the motor have been greatly reduced.

A New Shade Carrier Ring, Holder Lock and Flexible Grip.

We have received from MESSRS. LAMLOK, LTD., 237, Acton Lane, Chiswick, London, W.4, a lampholder fitted with a new shade carrier so designed that the ring carries a sleeve, expanded at the top end, which grips the shade. The actual ring, with the usual milled edge, is at the bottom of the sleeve which is about ¼ in. deep, thus allowing it to be adjusted by the fingers in narrow shades which either necessitate the use of a shade carrier ring remover or great inconvenience with the ordinary type of ring. The device also permits of much quicker adjustment or removal, in that the ring is passed over a minimum number of the threads on the liner of the lampholder.

The holder also carries a locking device, consisting of a threaded hole at one side of the top of the holder, into which a pin is screwed which will engage with one of the side slots in the porcelain. A flexible gripping nipple is also incorporated in the holder; this takes the form of a bush of insulating compound with a central hole through which the flex passes. It is screwed into the top of the holder from the inside and when the holder is fixed, it is screwed down so that the leads are gripped between the porcelain and the flat bottom of the bush.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Special A.C. Rectifiers.

In answer to "Rectifier's" letter in your issue of July 17th, we may say that we are now manufacturing apparatus by which the necessary high-pressure required by wireless receiving sets can be obtained from an a.c. supply, which is laid on in many households.

We are supplying large numbers of these outfits, and customers are more than satisfied with the results they are obtaining. We may say it is possible by simple adjustment to so smooth out the current that no continuous note is audible in a loud speaker.

It will interest your readers to know that the whole arrangement is effected by transformers and condensers, and the apparatus is therefore entirely free from liquid and other objectionable features.

Gent & Co., Ltd.
H. P.

Leicester, *July 22nd*, 1925.

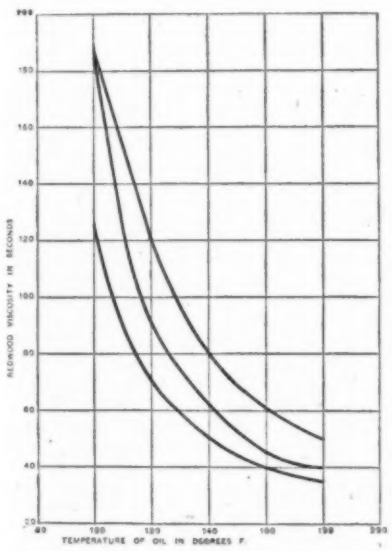
Lubricating Oil for Turbines.

As you have considered Mr. J. E. Stewart's letter dated July 2nd to be, as he suggests, of such importance to be published in your July 10th issue, I feel sure that a reply to the criticisms will not be out of place. I shall endeavour to deal with the points *seriatim*.

Mr. Stewart is under a misapprehension concerning the attitude of the turbine maker in his recommendation of lubricating oil. Final decision, it is true, is practically left in the hands of the turbine builder, as in the case of all other makers of machinery, because he is responsible for the well-being of the plant during the guarantee period. In most cases the process is simply that the oil supplier prepares an oil which he believes to be suitable and submits it to the turbine builder, who, if he thinks fit, tests it in a turbine, provided it conforms to the usual preliminary laboratory tests, which nowadays are fairly accurately understood and capable of interpretation. If the results of the running test are such as to commend themselves to the turbine maker, then the oil may be put on his list for recommendation. Thus, the decision is a dual one, and not one of shifted responsibility.

I am of the opinion that there are neither turbine builders nor turbine users who know any recognised turbine oil which does not possess a good temperature coefficient of viscosity, and I might go further and say that it is not customary to give the viscosity at one temperature only. The usual temperatures are 70 deg. F. and 140 deg. F., but when a third temperature is desired, it is usually taken at 100 deg. F. in the case of turbine oils.

The "curves" which Mr. Stewart gives are not really indicative of the incongruity of the oil makers' statements, but of the misconception which can be portrayed by not drawing the curves according to established custom, as he admits should have been done. The curves are probably as follows:—



which puts a very different construction upon Mr. Stewart's comments.

E. A. Evans,
Chief Chemist, C. C. Wakefield & Co., Ltd.

London, E.C.2.,
July 22nd, 1925.

We have read with interest the letter in your issue of July 10th of Mr. J. E. Stewart. We notice, however, that the statement is made therein that it is customary for oil manufacturers to give viscosity in seconds at one temperature only.

We cannot help thinking that Mr. Stewart's experience has been an unfortunate one as we believe it is the custom of most firms of repute to give viscosities at more than one temperature, it being well known to the oil trade that one temperature is by no means indicative of the quality of an oil.

The enclosed booklet issued by us on turbine lubrication may be of interest. We thank you in anticipation of your correcting a statement which, we think, may give rise to an altogether false impression as to the attitude of the oil trade generally. That there are certain firms which will wilfully withhold, either through ignorance or design, certain information is probably true, but this does not apply to any of the well-known houses, which are only too anxious, as a rule, to clearly state the merits of their products in such a way that the engineer or technical man can fully appreciate the quality of the article he is buying.

Sterns, Limited,
H. BELL THOMPSON,
Director and General Manager.

London, E.C.2, *July 24th*, 1925.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

Carbon Electrodes. — On July 21st, Mr. O. NICHOLSON asked the Chancellor of the Exchequer why, seeing that American carbon electrodes were permitted to be imported into this country after payment of 33⅓ per cent. "Key Industries" duty without any additional deposit, an additional 20 per cent. was added to the 33⅓ per cent. "Key Industries" duty charged on carbon electrodes imported into this country from Austria.

Mr. CHURCHILL said he was informed that the values declared for the purposes of the assessment of key industry duty on carbon electrodes imported from Austria were considerably below those declared for similar carbons imported from America. The question whether the declared values of the Austrian carbons could be accepted was at present under consideration by the Commissioners of Customs and Excise, and, pending a decision, delivery of the carbons was being allowed on the deposit of a sum equal to the duty based on the declared values plus 20 per cent. of such duty. He understood that a decision on the question of value would probably be given at an early date.

Transmitting Radio Licences.—On July 21st, Captain W. BENN asked the Postmaster-General what scale of charges he proposed to lay down for transmitting licences under the new Bill; and whether he could give any undertaking that the scale would not be exceeded in the future.

SIR W. MITCHELL-THOMSON said that the fees for experimental sending licences were reduced some months ago, and the charges now made were an initial fee of 10s. and an annual fee of £1 where the power authorised did not exceed 10 watts, and an initial fee of £1 and an annual fee of £2 where the power exceeded 10 watts. The hon. member could not expect him to give a pledge that these fees would never be increased. He could give an assurance that no alteration was at present contemplated.

Unemployment Figures.—On July 22nd, Mr. BETTERTON Parliamentary Secretary to the Ministry of Labour, informed Sir F. Rice that the number of electrical wiremen, linesmen, and fitters on the registers of Employment Exchanges in Great Britain at June 1st was 6,937.

Wireless on Ships.—On July 22nd, Mr. B. SMITH asked the President of the Board of Trade, with reference to the Merchant Shipping (Wireless Telegraphy) Act Amendment Rules, 1925, issued on April 21st, 1925, whether he would seek powers which would enable the Board of Trade to require Class II vessels to carry more than one qualified operator, in the same way as he had secured powers to exempt foreign ships from the requirements of the Merchant Shipping Wireless Telegraphy Act of 1919.

SIR BURTON CHADWICK, Parliamentary Secretary to the Board of Trade, said he was not convinced that the alteration of the law proposed was necessary in the interest of safety of life at sea.

The London and Home Counties Electricity District.—On July 27th, Lt.-Col. MOORE-BRABAZON, Parliamentary Secretary to the Ministry of Transport, moved the approval of the Order made by the Electricity Commissioners constituting the London and Home Counties Electricity District, and incorporating the London and Home Counties Joint Electricity Authority. The Order was approved with slight modifications.

The Mersey Tunnel.—Further evidence has been heard by the House of Lords Committee, which is considering this scheme, during the past week, and it was expected that the hearing would be concluded during the week.

The Wireless Telegraphy (Explanation) Bill.—This Bill was read a second time in the House of Lords on July 27th.

Japan's Electrical Imports and Exports.

SINCE the earthquake in Tokio and Yokohama, which caused the destruction by fire of a quantity of the Government's statistical data, the Japanese import and export trade returns have not been issued in very great detail. It is, however, now possible to compare the figures for 1922, 1923 and 1924. The following table shows the values of Japan's imports and exports of electrical and allied material during these three years. It will be noticed that exports, except those of telephones and electric lamps, have declined progressively, whilst in 1924 imports of electrical machinery were unusually large.

Exports.

	1922. Yen (Thous.)	1923. Yen (Thous.)	1924. Yen (Thous.)
Insulated electric wire.—			
Total	7,816	1,609	1,373
To China	6,712	661	317
,, Kwantung	849	677	889
,, Hong Kong	164	63	91
Electrical machinery.—			
Total	3,028	1,851	1,755
Telephones.—			
Total	119	154	143
Electric lamps.—			
Total	1,244	1,335	1,829

Imports.

Insulated electric wire, submarine telegraphic or telephonic cables	831	443	736
Other cables	485	1,885	717
Wattmeters	1,409	1,252	3,868
Telegraphic or telephonic instruments and parts ...	1,359	859	4,338
Steam boilers and parts ...	6,403	2,949	5,473
Steam turbines	1,052	499	2,298
Steam engines	121	140	32
Water turbines	2,979	3,028	1,463
Dynamos, motors, transformers, &c.	11,947	10,835	20,978
Dynamo sets	877	525	368
Electric carbons	358	314	606

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

216. "Electricity meters." Measurement, Ltd. January 12th, 1923. (209,733.)

5,035. "Electric resistance units, rheostats, and the like." W. R. Micklewright and Micklewright, Ltd. February 27th, 1924. (236,248.)

7,969. "Control systems for electric circuit-breakers." British Thomson-Houston Co., Ltd. March 30th, 1923. (213,603.)

8,013. "Multiple wiring device for wireless receivers and the like." W. H. Franklin. March 29th, 1924. (236,261.)

8,110. "Telegraphic relays." Western Electric Co., Ltd. (Western Electric Co., Inc.). March 31st, 1924. (Patent of addition not granted.) (236,264.)

8,144. "Processes of manufacturing selenium cells for photo-electric work." R. Hart. March 31st, 1924. (236,266.)

8,336. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and A. A. Pollock. April 2nd, 1924. (236,277.)

8,374. "Automatic or semi-automatic telephone systems." Automatic Telephone Manufacturing Co., Ltd., and W. Saville. April 2nd, 1924. (236,282.)

8,386. "Apparatus for testing the cells of secondary batteries." A. W. Rayworth. April 3rd, 1924. (236,284.)

8,399. "Electrical conduit fittings for jointing conduit tubes." F. H. Terry and W. Sale. April 3rd, 1924. (236,285.)

8,473. "Acoustic amplifiers, trumpets, horns or sound conduits for loud-speaking telephonic apparatus." E. A. Graham. April 3rd, 1924. (236,288.)

8,513. "Electric discharge devices for vacuum tubes." E. V. Hayes-Gratze. April 4th, 1924. (236,289.)

8,638. "Apparatus for heating liquids by electricity." W. A. White. April 5th, 1924. (236,292.)

8,639. "Electric circuit-breakers." E. B. Wedmore and British Electrical and Allied Industries Research Association. April 5th, 1924. (236,293.)

8,698. "Magneto-electric ignition machines." A. G. L. Neighbour. April 6th, 1923. (213,930.)

9,055. "Loud speakers." W. J. Davis and Edison Swan Electric Co., Ltd. April 9th, 1924. (236,298.)

9,236. "Automatic switches for use in telephone systems." Western Electric Co., Ltd. (G. Deakin). April 11th, 1924. (236,301.)

9,252. "Controllers for electric circuits." N. E. North and Metropolitan-Vickers Electrical Co., Ltd. April 11th, 1924. (236,303.)

9,607. "Electromagnetic transmitters and receivers for reproducing sound." A. F. Sykes. April 15th, 1924. (Addition to 160,223 as modified by 186,668.) (236,313.)

9,834. "Electric accumulators." W. H. Simms (H. S. Potter). April 17th, 1924. (236,316.)

10,111. "Means for controlling electric circuits at pre-determined times." A. Woosnam (L. Ederer). April 23rd, 1924. (236,318.)

11,299. "Protective devices for electric lamp regulators." E. Dick. May 7th, 1923. (215,762.)

11,444. "Valve-holders for wireless receiving apparatus." W. S. Graf-Baker. May 8th, 1924. (236,333.)

12,390. "Crystal detectors for wireless reception." Sterling Telephone and Electric Co., Ltd., and T. D. Ward-Miller. May 20th, 1924. (236,340.)

12,674. "Electric protection of transformers." Electrical Improvements, Ltd., and G. L. Porter. May 23rd, 1924. (236,343.)

13,001. "Means for introducing capacity effects in alternating electric current systems and apparatus." T. F. Wall. May 27th, 1924. (236,350.)

13,816. "Devices for retaining a smooth and even surface on commutators and slip-rings of electric machines." J. H. Bennison and F. Pape. June 6th, 1924. (236,355.)

15,111. "Devices for controlling electric circuits." British Lighting and Ignition Co., Ltd., and J. C. Hutton. June 23rd, 1924. (236,363.)

18,323. "Sound-reproducing instruments." British Thomson-Houston Co., Ltd. January 25th, 1924. (228,102.)

18,413. "Electric batteries." Three Star Accumulators, Ltd., and C. Kendall. August 1st, 1924. (Addition to 185,889.) (236,398.)

19,499. "Apparatus for converting oscillating electric currents into sound and *vice versa*." British Thomson-Houston Co., Ltd., and A. P. Young. August 16th, 1924. (236,403.)

29,827. "Arrangements of magnetos and dynamos applied to internal-combustion engines." Crossley Motors, Ltd., and T. D. Wishart. December 11th, 1924. (236,107.)

20,362. "Tuning device for use in wireless telegraphy and telephony." H. F. Bowers and E. V. Bowers. August 28th, 1924. (236,410.)

29,938. "Telephone phantoms with reduced cross-talking phenomena, and a method of manufacturing the same." Felten & Guilleaume Carlswerk Akt. Ges. January 4th, 1924. (227,095.)

23,195. "Electric time-limit relays of the induction type." W. H. Peterus and Allmanna Svenska Elektriska Aktiebolaget. October 1st, 1924. (238,434.)

23,308. "Mechanism for effecting angular displacement of the brushes in commutator dynamo-electric machines." British Thomson-Houston Co., Ltd. October 3rd, 1923. (222,877.)

23,667. "Electric current rectifier for use in effecting electrical measurements and the like." W. J. H. Janvier. October 10th, 1923. (223,231.)

24,490. "Machines for making filamentary coils." British Thomson-Houston Co., Ltd. October 16th, 1923. (223,575.)

24,818. "Electrical switches." British Thomson-Houston Co., Ltd. October 19th, 1923. (223,598.)

25,283. "Control of dynamo-electric machines." British Thomson-Houston Co., Ltd. (General Electric Co.). October 23rd, 1924. (236,430.)

25,572. "Electrical condensers." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (W. Dubilier). October 27th, 1924. (236,431.)

27,045. "Electric short-circuiting rod." P. Gosslar. November 12th, 1924. (236,437.)

27,678. "Telephonic receivers." E. A. Graham. November 19th, 1924. (236,442.)

28,254. "Switching apparatus for use in telephone or like systems." Siemens & Halske Akt. Ges. January 26th, 1924. (228,113.)

28,605. "Variable inductance for radio signalling apparatus." E. Langenickel. November 28th, 1924. (236,100.)

28,888. "Electric time-switches." W. A. Andersen. December 29th, 1923. (226,796.)

29,680. "X-ray apparatus." British Thomson-Houston Co., Ltd. December 10th, 1923. (226,208.)

30,885. "Electric outlet boxes." British Thomson-Houston Co., Ltd. December 31st, 1923. (227,099.)

30,886. "Electric outlet boxes." British Thomson-Houston Co., Ltd. December 31st, 1923. (227,100.)

30,981. "Maximum demand indicator and signalling device for electricity meters." Landis & Gyr Soc. Anon. January 14th, 1924. (Addition to 206,505.) (227,813.)

31,290. "Distributing box for electrical installations." R. Bosch Akt. Ges. January 24th, 1924. (228,127.)

1925.

44. "Electrical controllers." Arrol & Co., Ltd., Sir W. Pitt, R. M. and W. De Renzi. January 1st, 1925. (236,460.)

1,875. "Operating handles for electric motor control switches." British Thomson-Houston Co., Ltd., and C. T. Hanna. January 21st, 1925. (236,469.)

2,204. "Electric motor-starting switches." British Thomson-Houston Co., Ltd. April 26th, 1924. (232,922.)

2,751. "Electrically-propelled vehicles." S. Attila. January 30th, 1925. (236,477.)

5,457. "Light projectors." British Thomson-Houston Co., Ltd. February 28th, 1924. (230,086.)

5,757. "Electric drink-mixers." R. B. Gilchrist. June 14th, 1924. (235,523.)

6,069. "Incandescent lamps for vehicle headlamps." British Thomson-Houston Co., Ltd. March 25th, 1924. (231,449.)

7,807. "Automatic or semi-automatic telephone systems." Automatic Telephone Manufacturing Co., Ltd., and J. E. Ostline. April 1st, 1924. (Cognate application 7,808/25, a divided application on 8,569/24.) (Divided application on 8,289/24.) (236,497.)

7,876. "Switch for use in connection with the electric lighting of vehicles." Luma-Werke Akt. Ges. March 24th, 1924. (231,202.)

8,270. "Safety devices for electric cubicle switchgear." Crompton & Co., Ltd., and W. F. Jones. March 27th, 1925. (236,498.)

12,142. "Radio receiving systems." J. E. Callahan. May 17th, 1924. (234,094.)

14,549. "Electrically-driven fans." T. Froich (firm of). June 6th, 1924. (235,200.)

German Industry in June.—The Commercial Secretary at Berlin (Mr. J. W. F. Thelwall) has forwarded to the Department of Overseas Trade a review, based on the reports of the Prussian Chambers of Commerce, of the commercial and industrial situation in Germany during June. He states that the position in the electro-technical industry was not uniform. Where the general dearth of money was not immediately felt in view of the existence of a working balance, the influx of orders was very brisk, particularly in the case of electro-technical works and tramways, and it was endeavoured to carry out improvements and extensions on a large scale. Price increases for certain groups of apparatus occurred at the beginning of the month. Foreign prices were also raised, though with great caution and reserve.